



**A SOCIOCULTURAL MODEL OF PLAY-BASED PEDAGOGY FOR
TEACHING MATHEMATICS IN DIVERSE GRADE R CLASSROOMS
IN SOUTH AFRICA**

By

ROSEMARY BRIEN

Thesis submitted in fulfilment of the requirements of the degree

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in the

DEPARTMENT OF EARLY CHILDHOOD EDUCATION

FACULTY OF EDUCATION

UNIVERSITY OF PRETORIA

SUPERVISOR: A.E. MUTHIVHI

August 2024

DECLARATION OF ORIGINALITY

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I declare that this thesis, *A Sociocultural Model of Play-Based Pedagogy for Mathematics in Diverse South African Classrooms*, which I hereby submit for the degree Philosophiae Doctor in Early Childhood Education is my own work and has not previously been submitted by me for a degree at this, or any other tertiary institution.

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28 March 2022

Dear Ms RDL Rushton (Brien)

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Department:	Early Childhood Education

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Best wishes



Prof Funke Omidire
Chair: Ethics Committee
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DEDICATION

This thesis is dedicated to my late mother, Janet Brien, whose love of children was an inspiration to me.

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I extend my sincere thanks to Professor Azwihangwisi Muthivhi for his patient guidance as my supervisor.

I am also grateful for the support and insights provided by my colleagues at the CHAT Africa forum.

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To my partner, Richard, my brother John, and my sons, Nick and Chris, thank you for your support throughout this process.

I also want to acknowledge my dearest friend, Van, for her encouragement.

ABSTRACT

This study investigates the role of play-based pedagogy in facilitating mathematics teaching in diverse South African Grade R classrooms. The primary research question driving this enquiry is how a cultural-historical activity theory (CHAT) model of play-based pedagogy can enhance mathematics instruction in Grade R. To address this question, several secondary research questions are posed, focusing on the use of play in mathematics teaching, strategies for promoting a sociocultural model of play, teacher responses to culturally relevant pedagogical models, and the implications of implementing a play-based approach in diverse backgrounds. The research aims to explore the integration of a sociocultural model for mathematics teaching, assess teacher responses to pedagogical collaboration and mentoring, and identify implications and future research directions for play-based mathematics education in Grade R. The study's objectives include exploring existing sociocultural theories of play-based learning, analysing Grade R teachers' efforts to integrate play into teaching, assessing the effectiveness of a sociocultural model in teaching emergent mathematics, and proposing suggestions for enhancing the relationship between play and emergent mathematics for teachers, curriculum developers, and policymakers through the use of the CHAT model.

Three Grade R classrooms were purposively selected for the study based on the criteria that they represented linguistically, culturally, and socio-economically diverse communities. The research was qualitative and consisted of a five-stage plan of observations, followed by interview cycles. The data was analysed into themes with the support of the CHAT framework to guide analysis and recommendations. The findings revealed that there is potential for the pedagogy of play to be implemented more actively in classrooms with the support of a sociocultural model, and in doing so, replace assessment practices and formal teaching that conflict with play-based teaching. This implies ongoing collaboration as a collective and teacher mentorship which is less top-down and more partnership-based.

Keywords: play-based pedagogy, mathematics teaching, Grade R classrooms, diversity, CHAT framework, assessment, teacher mentorship, collaboration

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A SOCIOCULTURAL MODEL OF PLAY-BASED PEDAGOGY FOR TEACHING MATHEMATICS IN DIVERSE GRADE R CLASSROOMS IN SOUTH AFRICA

This letter serves to confirm that I have edited the language of the above-mentioned thesis authored by Rose Brien. My editing included checking the document for consistent and clear use of language, the correctness of grammar, and the logical flow within and between sentences. I am not responsible for any changes made by the author after my edit, nor for ensuring the originality of the work, or the correctness of the referencing.

My background in the field of writing and editing is founded on my previous experience as a professionally registered environmental scientist carrying out peer-reviewed environmental and social impact assessment. I have further taught English as a foreign language. In recent years I have conducted editing of numerous academic articles, as well as Doctoral and Master's theses in a wide range of fields. I have also performed online academic editing. As an Associate Member of the Professional Editors' Guild (www.editors.org.za), I receive peer support and attend regular training sessions in the field of editing.

Yours sincerely,



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TABLE OF CONTENTS

DECLARATION OF ORIGINALITY	i
ETHICAL CLEARANCE CERTIFICATE	ii
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT	v
LANGUAGE EDITOR’S DISCLAIMER	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	xiii
LIST OF FIGURES	xiv
LIST OF ABBREVIATIONS	xv
CHAPTER 1	1
INTRODUCTION AND BACKGROUND	1
1.1 INTRODUCTION	1
1.2 RATIONALE.....	2
1.3 PROBLEM STATEMENT	2
1.4 RESEARCH QUESTIONS, AIMS AND OBJECTIVES OF STUDY	3
1.4.1 Primary Research Question	4
1.4.2 Secondary Research Questions	4
1.4.3 Research Aims	4
1.4.4 Research Objectives.....	5
1.5 INITIAL CLARIFICATION OF CONCEPTS.....	5
1.5.1 General Genetic Law of Cultural Development	5
1.5.2 Mediation	6
1.5.3 Internalisation	7
1.5.4 The Zone of Proximal Development	8
1.5.5 Spontaneous and Scientific Concepts	9
1.6 PRELIMINARY LITERATURE REVIEW	9
1.6.1 Types of Play	9
1.6.2 Play in Early Childhood Education.....	11
1.6.3 Play in Early Childhood Policy and Curriculum	11

1.6.4	The Role of Adults in Play	12
1.6.5	Facilitating Emergent Mathematics in Early Childhood Education	13
1.6.6	Emergent Mathematics in CAPS	13
1.6.7	Diversity in Early Childhood Education.....	14
1.6.8	Conclusion	15
1.7	INTRODUCTION TO THE CHAT FRAMEWORK	16
1.8	RESEARCH METHODOLOGY	19
1.8.1	Research Design	19
1.8.2	Research Plan.....	20
1.9	THE ROLE OF THE RESEARCHER	21
1.10	RESEARCH SITE AND SELECTION OF PARTICIPANTS	22
1.11	DATA COLLECTION PROCEDURES	23
1.11.1	Data Collection	23
1.11.2	Data Analysis	25
1.12	ETHICAL CONSIDERATIONS.....	25
1.13	OUTLINE OF CHAPTERS.....	27
1.14	SUMMARY	27
	CHAPTER 2.....	28
	LITERATURE REVIEW	28
2.1	INTRODUCTION	28
2.2	THE PEDAGOGY OF PLAY	28
2.2.1	Types of Play	29
2.2.1.1	Symbolic Play	29
2.2.1.2	Construction Play	30
2.2.1.3	Sociodramatic Play.....	30
2.2.1.4	Exploratory Play.....	31
2.2.1.5	Parallel Play.....	31
2.2.1.6	Cooperative Play	31
2.2.2	The Role of Play	32
2.2.3	The Role of Adults in Play	34
2.3	EMERGENT MATHEMATICS IN EARLY CHILDHOOD EDUCATION..	35
2.4	How Children Learn Mathematics.....	35
2.4.1	How the Facilitation of Emergent Mathematics is Conceptualised.....	40

2.4.2	Emergent Mathematics and Play in CAPS	44
2.5	IMPLEMENTING GRADE R IN A DIVERSE SOCIETY.....	46
2.5.1	ECD, Grade R, and the Curriculum.....	46
2.5.2	Diversity of Cultures.....	48
2.5.3	Diversity in Language.....	49
2.5.4	Diversity of Socio-Economic Backgrounds	52
2.6	PLAY, MATHEMATICS, DIVERSITY, AND GLOBAL PERSPECTIVES	54
2.6.1	Merging the Literature	54
2.6.2	International Research	55
2.7	CONCLUSION.....	58
CHAPTER 3.....		62
THEORETICAL FRAMEWORK.....		62
3.1	INTRODUCTION	62
3.2	VYGOTSKY'S SEMINAL WORKS.....	63
3.2.1	General Genetic Law of Cultural Development	63
3.2.2	Mediation	64
3.2.3	Internalisation	67
3.2.4	The Zone of Proximal Development	68
3.2.5	Scientific and Spontaneous Knowledge	70
3.2.6	The Activity System	71
3.2.7	Implications of Vygotsky's Work.....	75
3.3	SUBSEQUENT WORK AND GENERATIONS.....	76
3.4	ENSUING CONCEPTS	79
3.4.1	The Object of Activity	79
3.4.2	Dialectics and the Germ Cell.....	80
3.4.3	Contradictions.....	83
3.4.4	The Significance of Moving from Concrete to Abstract	85
3.4.5	CHAT Conceptions of History, Culture, and Development.....	86
3.4.6	Expansive Learning and Transformative Agency.....	87
3.4.7	Application of CHAT to Educational Settings	88
3.5	CONCLUSION.....	89
CHAPTER 4.....		91
METHODOLOGY		91

4.1	INTRODUCTION	91
4.2	RESEARCH QUESTIONS	92
4.2.1	Primary Research Question	92
4.2.2	Secondary Research Questions	92
4.2.2.1	Secondary Research Question 1	92
4.2.2.2	Secondary Research Question 2	92
4.2.2.3	Secondary Research Question 3	92
4.2.2.4	Secondary Research Question 4	92
4.3	RESEARCH PARADIGM	92
4.4	RESEARCH APPROACH	94
4.4.1	Research Design	95
4.4.1.1	Interpretivism	96
4.4.1.2	The Activity System as a Unit of Analysis.....	97
4.4.1.3	Research Plan	98
4.5	RESEARCH METHODS	99
4.5.1	Sampling of Participants	100
4.5.2	Research Setting	100
4.5.3	Research Participants	101
4.5.4	Data Collection	102
4.5.4.1	Observation	103
4.5.4.2	Document Sampling.....	105
4.5.4.3	Individual Semi-Structured Interviews	105
4.5.4.4	Focus Group Meetings	107
4.5.4.5	Audio Recordings.....	109
4.6	DATA ANALYSIS.....	109
4.6.1	Transcription	110
4.6.2	Thematic Analysis	111
4.7	TRUSTWORTHINESS	112
4.7.1	Credibility	113
4.7.2	Dependability.....	113
4.7.3	Transferability.....	114
4.8	ETHICAL CONSIDERATIONS.....	115
4.8.1	Ethical Clearance	115

4.8.2	Informed Consent	116
4.8.3	The Role of the Researcher.....	117
4.8.4	Anonymity and Confidentiality	118
4.9	CONCLUSION.....	119
	CHAPTER 5.....	120
	DATA ANALYSIS.....	120
5.1	INTRODUCTION	120
5.2	THEME 1: CULTIVATING EMERGENT MATHEMATICS THROUGH PLAY 124	
5.2.1	Teachers’ Planning for Emergent Mathematics.....	124
5.2.2	Facilitating Emergent Mathematics Through Play	126
5.3	THEME 2: NAVIGATING PLAY-BASED MATHEMATICS AMID CONSTRAINTS.....	133
5.3.1	Challenges of Diversity and Teachers’ Beliefs.....	134
5.3.1.1	Supporting Diversity Through Play-Based Learning.....	135
5.3.1.2	Teachers’ Values of Diverse Languages	137
5.3.2	Assessment Constraints that Limit Play	141
5.3.2.1	Policy, Practice, and Surfacing Tensions.....	142
5.3.2.2	Emergent Mathematics Assessment Tasks and Implications	147
5.3.3	Lack of Support	151
5.4	SUMMARY OF CONTRADICTIONS.....	157
5.5	ARRIVING AT THE GERM CELL	158
5.6	THEME 3: TEACHERS’ OPENNESS TO A PLAY-BASED MODEL	160
5.6.1	Dialectic Iterations	160
5.6.2	Iteration 1	161
5.6.3	Iteration 2	162
5.6.4	Iteration 3	164
5.6.5	Piloting and Feedback.....	166
5.7	SUMMARY	169
	CHAPTER 6.....	172
	DISCUSSION.....	172
6.1	INTRODUCTION	172
6.2	MAPPING THE JOURNEY	172

6.3	ALIGNING FINDINGS WITH EXISTING KNOWLEDGE.....	174
6.4	FINDINGS IN DIALOGUE WITH THE THEORETICAL FRAMEWORK 176	
6.5	FINDINGS ADDRESSING THE RESEARCH QUESTIONS.....	179
6.5.1	Sub-question 1:	179
6.5.2	Sub-question 2:	181
6.5.3	Sub-question 3:	183
6.5.4	Sub-question 4:	186
6.6	LIMITATIONS ARE STRENGTHS.....	189
6.7	RECOMMENDATIONS.....	191
6.8	CONCLUSION.....	192
	REFERENCES	195
	APPENDICES.....	205
	APPENDIX A: PERMISSION LETTER WCED.....	205
	APPENDIX B: PERMISSION LETTER SCHOOL HEAD.....	208
	APPENDIX C: PERMISSION LETTER TEACHERS	212
	APPENDIX D: CONSENT FORM TEACHERS	216
	APPENDIX E: PERMISSION LETTER TO PARENTS	217
	APPENDIX F: INFORMATION AND ASSENT FORM MINORS	220
	APPENDIX G: ETHICAL CLEARANCES	223
	APPENDIX H: INTERVIEW SCHEDULE	226
	APPENDIX I: TRANSCRIPT LEARNERS.....	228
	APPENDIX J: INTERVIEW WITH TEACHER M.....	231
	APPENDIX K: INTERVIEW TEACHER A.....	243
	APPENDIX L: INTERVIEW TEACHER S.....	254
	APPENDIX M: FOCUS GROUP MEETING ONE.....	276
	APPENDIX N: FOCUS GROUP MEETING TWO.....	286
	APPENDIX O: FINAL FOCUS GROUP INTERVIEW.....	294

LIST OF TABLES

Table 1.1: Research Plan	20
Table 4.1: Teacher Profiles.....	101
Table 5.1: Mathematics Assessments.....	142
Table 5.2: Textual Analysis.....	163

LIST OF FIGURES

Figure 1.1: The Activity System	18
Figure 2.1: The Counting Pathway.....	37
Figure 3.1: Basic Mediation Triangle.....	73
Figure 3.2: Adapted Mediation Triangle	74
Figure 4.1 Research Plan	99
Figure 5.1: Free Play with Unifix.....	129
Figure 5.2: Discrete and Continuous Measurement	130
Figure 5.3: Activity System Analysis: Adapted from Cole and Engeström (1993).....	133
Figure 5.4: A Learner's Assessment on Symmetry.....	149
Figure 5.5 : Termly Assessment Rubric	150
Figure 5.6: Cramped Play Area	153
Figure 5.7: Example of Puzzle	154
Figure 5.8: Activity System.....	157

LIST OF ABBREVIATIONS

BELA	Basic Education Laws Amendment
BERA	British Ethical Research Association
CAPS	Curriculum Assessment Policy Statement
CBOs	community-based organisations
CHAT	cultural-historical activity theory
CPD	continuous professional development
DBE	Department of Basic Education
DoE	Department of Education
ECD	early childhood development
Grade R	Grade Reception
HOD	head of department
ITE	initial teacher education
MKO	more knowledgeable other
NGOs	non-governmental organisations
NCS	National Curriculum Statement
NHA	National Health Act
PCK	pedagogical content knowledge
POPIA	Protection of Personal Information Act
PRimTEd	Primary Teachers' Mathematics Education
TAS	transformation activist stance
SES	socio-economic status
STEM	science, technology, engineering, and mathematics
WCED	Western Cape Education Department
ZPD	zone of proximal development

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Interest in early childhood education has grown globally owing to a mounting recognition of its importance in shaping a child's overall development. Play, characterised by its spontaneity, creativity, and engagement, has long been recognised as a crucial aspect of childhood development. Simultaneously, mathematics education has evolved from a traditional, rote learning approach to one emphasising conceptual understanding and problem-solving skills. Recognising the intersection between play and mathematics as a fertile ground for exploration, this study explores the potential of using cultural-historical activity theory (CHAT) to explore the dynamic relationships shaping this pedagogical intersection.

In the domain of early childhood education, the connection between the dynamics of play and emergent mathematics has emerged as a plausible field of study. The foundational years of a child's life are marked by a natural inclination towards play, a powerful and spontaneous learning tool that transcends cultural and linguistic boundaries (Fleer, 2020; Hedegaard & Munk, 2019). Early childhood education lays the foundation for future learning by developing essential skills such as communication, problem-solving, and critical thinking that are crucial for success in later academic and professional pursuits.

Simultaneously, the emergence of mathematical concepts during these formative years lays the groundwork for a child's future academic success. This thesis explores the intricate relationship between play and emergent mathematics, seeking to demonstrate how playful activities can serve as a catalyst for mathematical understanding in young learners in diverse Grade R classrooms. While the importance of play is a topic that has been established universally, there is still a need to ascertain how play is being promoted and valued within classroom settings. Play and the influence of the teacher both assume important roles in teaching and learning, as outlined in the Curriculum Assessment Policy Statement (CAPS):

One of the most important roles of the Grade R teacher is to provide learners with an environment that is safe, clean, and caring, with adequate opportunities to play

and explore the world under the careful guidance of their teacher. (DBEa, 2011a, p. 10)

Additionally, the increasing academic expectations placed on teachers to ensure that learners are ready for school pose a threat to play-based learning, as they contradict pedagogical philosophies of how young children learn.

1.2 RATIONALE

As an experienced educator in the field of early childhood and foundation phase education, the researcher has identified that there are unanswered questions relating to the nature of play and the role of the teacher in facilitating such play. Furthermore, tendencies to lean towards formal written tasks and worksheets have been identified, and there are ongoing concerns over the nature of activity in Grade R classrooms. This study has the potential to provide insight into how best to support teachers in moving towards play-based pedagogy and through doing so, the learners will benefit from experiencing more learner-centred ways of constructing knowledge within their diverse classroom contexts. Specifically, in the South African context, studying play-based teaching for emergent mathematics in diverse Grade R classrooms is essential for promoting developmentally appropriate, culturally relevant, and equitable mathematics education practices that support the diverse needs of young learners.

1.3 PROBLEM STATEMENT

Traditional pedagogical approaches have often compartmentalised play and academic subjects, treating them as separate entities with little overlap. However, contemporary educational theorists and practitioners increasingly acknowledge the reciprocal relationship between play and cognitive development, particularly in acquiring mathematical skills. Despite the recognised value of play, there is a significant lack of clarity on how play should be utilised as a teaching and learning tool to facilitate emergent mathematics in Grade R classrooms. Teachers often lack on-site support and practical strategies for integrating play into their teaching practices that will cater to the diverse needs of their learners. Moreover, there is a prevailing trend towards excessive formal learning in Grade R classrooms, characterised by a strong emphasis on worksheets and generic, prescriptive programmes for teaching mathematics. Furthermore, there is a lack of clarity about exactly how play as a teaching and learning tool should be used to

facilitate emergent mathematics in Grade R classrooms. Linked to this, teachers lack on-site support as to how to integrate play into their teaching practices to support the diverse needs of the learners (Spencer-Smith et al., 2019)

The value of play is echoed in policy, specifically concerning curriculum policy which explicitly prescribes that play should be the vehicle for teaching and learning and that, first and foremost, experiences should be hands-on and occur during guided free play within the Grade R daily programme (DBEa, 2011a, p. 15). However, local studies describe a lack of guidance specifically as to how play should be supported and to what extent the teacher guides and facilitates the process to optimally benefit the learners (Visser et al., 2019). There is an assumption that all teachers possess a universal understanding of the nature of play and that it is seamlessly incorporated into their daily programme; however, Excell and Linington (2020) describe the elusiveness of play that manifests in many unique contexts that make it difficult to define. For example, in CAPS, there is a reference to “the principles of integration and play-based learning” (DBEa, 2011a, p. 14) and it is suggested that play and routine activities be planned for. Yet, CAPS later proposes that free play should only occur at the end of routine activities when the learners need “time-out” (DBEa, 2011a, p. 15).

Thus, there is a disconnect between theory and practice in early childhood education, particularly concerning the integration of play and emergent mathematics in Grade R classrooms. While policy advocates for play-based learning, teachers lack clear guidance on effectively using play as a tool for teaching emergent mathematics. Existing studies highlight the complexity of incorporating play into the curriculum, and the need for more support for teachers in this regard (Selepe et al., 2024).

1.4 RESEARCH QUESTIONS, AIMS AND OBJECTIVES OF STUDY

This study seeks to bridge the gap between theory and practice, contributing to a deeper understanding of how play can serve as a medium for emergent mathematics. The research sets out to explore how a sociocultural model of play-based pedagogy for Grade R learners could be implemented to facilitate mathematics teaching – and thereby foster effective number concept development for mathematics. Through doing so, the study aims to contribute to the body of research on how to support and provide teachers with valuable, developmentally appropriate, and theoretically informed insight into how to

integrate play-based pedagogy. Additionally, owing to the nature of the model, it could be used in diverse settings as teaching is informed by the sociocultural settings in which the model is situated. Both aims will endeavour to add to the increasing volume of research in the field of developmental psychology.

1.4.1 Primary Research Question

The primary research question guiding this study is: How can a sociocultural model of play-based pedagogy facilitate mathematics teaching in diverse South African Grade R classrooms? The aforementioned question necessitates the following sub-questions and, in doing so, determines the objectives required for the successful fulfilment of this study.

1.4.2 Secondary Research Questions

1.4.2.1 How do Grade R teachers use play in their teaching of mathematics and what role does play have in their conception of the reception year pedagogy, and why so?

1.4.2.2 How can a sociocultural model of play be promoted and prioritised as an integral part of pedagogy for the teaching of mathematics in diverse Grade R classrooms?

1.4.2.3 How do teachers respond to a theoretically informed, yet culturally relevant model for the pedagogy of Grade R learners in diverse sociocultural classrooms and how can this model be introduced?

1.4.2.4 What are the implications and the limitations of implementing a play-based model for teaching mathematics in diverse backgrounds and what further research directions could benefit from both pedagogical and theoretical understanding of such an approach in Grade R classrooms?

1.4.3 Research Aims

With the research questions outlined, it can be said that the research intends to explore the role of play within Grade R teachers' conception of reception year pedagogy. In doing so, it investigates strategies for integrating sociocultural aspects of play into mathematics teaching methods. It also seeks to explore the potential benefits and challenges associated with implementing a sociocultural model of play in Grade R mathematics education.

The research thereby identifies strategies for introducing and integrating culturally relevant pedagogical models into diverse Grade R classrooms. Thus, it is anticipated to

explore potential research directions to enhance further pedagogical and theoretical understanding of play-based mathematics instruction in Grade R classrooms, considering diverse sociocultural contexts. Collectively, this study aims to deepen understanding of the role of play in mathematics instruction in Grade R classrooms, explore the integration of an accessible sociocultural model for promoting play-based learning, assess teacher responses to pedagogical collaboration, and identify implications and future research directions for play-based mathematics education.

1.4.4 Research Objectives

The objectives for this study relate to previous research into the nature of Grade R activity which revealed unanswered questions regarding the integration of play and emergent numeracy in the planning for and facilitation of mathematics into the Grade R daily programme (Rushton, 2020; Tlou & Feza, 2017). The objectives of this study are the outcome of the unanswered questions. There are four objectives in this study, namely: to explore existing sociocultural theories of play-based learning and emergent mathematics; to analyse Grade R teachers' efforts to integrate play into teaching in diverse classroom contexts, to assess the effectiveness of a sociocultural model in teaching emergent mathematics through play, and to propose suggestions for teachers, curriculum developers, and policymakers on enhancing the relationship between play and emergent mathematics.

1.5 INITIAL CLARIFICATION OF CONCEPTS

Owing to the nature of research, particularly in the field of sociocultural studies, concepts are never static and take shape as they are applied in the conceptualisation of theory (Maxwell, 2021a). This will be demonstrated in the remaining sections. However, in alignment with the standard requirements for this study, the concept clarification provided here furnishes an introduction to some core elements which are expanded on later.

1.5.1 General Genetic Law of Cultural Development

This law follows Vygotsky's stance on the mediating role that speech plays in development and learning. Vygotsky uses this model to effectively describe the intricate process of internalisation, namely; that, through social interaction, intermental processes a child can internalise processes. This practice is commonly recognised in children who

display external speech as a physical manifestation of their thought processes. He describes this as a prerequisite to internalisation, often when, in addition to this, egocentric speech occurs, where the child talks or whispers to himself. Vygotsky argued that in such a manner, the child is undergoing psychological transformation and is thus able to make sense of his or her world (Vygotsky, 1978).

Play is central in supporting this process as through interaction within a social context, the child can co-construct meaning, and learning is mediated through interpersonal relations. Vygotsky, and contemporary researchers in the field, describe the interconnectedness of creativity and imagination to children's real-life experiences in their culture and society, and, more specifically, they explain how these manifest through play activity (Cole & Engeström, 1993; Hedegaard, 2016).

The Grade R classroom is thus the activity system where this transformation can occur and through carefully supported activities present challenges (internal conflict). Ultimately it is through challenges, that the child can undergo transformation and learning and develop identity and personality. These shifts are vital stages, argues Vygotsky (1978) and are closely associated with internalisation and personality development requiring language, signs, and symbols to fully support the process.

1.5.2 Mediation

Closely linked to the process of internalisation is the term synonymous with the support underpinning internalisation, namely, mediation. Mediation describes a multifaceted means of support provided in the uptake and processing of knowledge and includes the influence of the teacher, tools, artefacts, and materials. This term also has strong associations with CHAT and owing to its positioning within this activity system, changes how the role of the teacher is viewed. Daniels (1996) explains how this role has “shifted” and can no longer be defined as a one-way process as traditional teaching assumes(d) but, rather, describes how communities mediate their learning through shared practices that are more reciprocal. Key to this is the role that artefacts (tools) assume in mediating the acquisition of knowledge; this once again confirms how learning is always culturally and socially embedded.

Stemming from this understanding, there is a requirement for teachers to understand the profound influence practices and tools for teaching and learning have on supporting the

planning and selection of activities that resonate with the learners' sociocultural contexts. The role of language in these shared practices is therefore essential and connects the learner with meaning-making when engaged with the activity. In addition to looking at the role of language in play, Vygotsky emphasised that it is not the act of play itself, but rather the meaning behind the play that is central to development and learning. He described how when the child is engaged in the practice of play, they are neither aware of the process of meaning-making occurring, nor of the development of autonomy through being able to consciously transform situations. He was also clear regarding the transformative role that adults play in potentially directing a child's play, thereby influencing their potential to be creative:

Just as a mould gives shape to substance, words can shape an activity into a structure. However, the structure may be changed or reshaped when the children learn to use the language in ways that allow them to go beyond previous experiences when planning future action (Vygotsky & Cole, 1978, p. 28).

1.5.3 Internalisation

Closely associated with Vygotsky's general genetic law is the process of internalisation. His seminal papers are explicit in their detail, and maintain that a child is only genuinely learning when provided with an environment structured in a manner that stimulates their cognitive functioning (Vygotsky, 1978). Using his model of general genetic law, he Vygotsky describes internalisation occurring through interaction (intermental understanding) and then becoming internalised (intramental understanding). This lends itself to the nature of Grade R classes, which require hands-on activity supported by language-rich experiences. When describing preschool children's encounters with mathematics, Henningsen (2013) emphasises how in child development, literacy, and mathematics are often spoken about in tandem; Henningsen argues that mathematics is as much about quantitative thinking as it is about quantitative communication.

Closely associated with change is the notion of *transformation*, described by Vygotsky as "critical periods" where a child undergoes new psychological accommodations as the child confronts life events that Vygotsky often referred to as "crisis periods". The transformation culminates in the child taking on a greater understanding of societal demands and structures (Vygotsky, 1978). Correspondingly, Vygotsky emphasised that

through play, the child can frame his or her relationship with the society in which the child is situated (Rieber & Wollock, 1997; Veraksa et al., 2022). This point is made clear by Gallimore (1992) who cites Elkonin (1978), Vygotsky's student. Elkonin also argued that play results in the child viewing situations from other points of view, and thus play provides the foundations for symbolic thought and encourages intentional thought through deliberate action. This understanding aligns with Vygotsky's stance on play being the portal for metacognition in young children (Vygotskiï & Kozulin, 1986).

1.5.4 The Zone of Proximal Development

The term "zone of proximal development" (ZPD) is familiar in educational psychology, particularly from a pedagogic stance. It is most helpful in describing the aforementioned junction or "teachable space" that nurtures the process of internalisation. It is in this space that the role of the educator or "more knowledgeable other" (MKO) comes to the fore. Vygotsky maintained that, through intentional instruction, aimed at guiding the child at the appropriate level, the child will be able to reach a higher place of psychological understanding that would not have otherwise been possible without intervention (Vygotsky & Cole, 1978). He also described how this form of mediation needs to be of a nature that is ahead of a child's development, yet still within their reach. He argued that in such a manner, a child would arrive at a metalevel of understanding.

Accordingly, the role of speech and the collaborative influence of the teacher in mediating cognitive processes, remain central to promoting learning. Moreover, mediation in the ZPD is key to the success of this study, both from analytical and application standpoints. The learner can be provided with opportunities to evolve through play that is mediated within the ZPD; this can be done via a rich and varied repertoire of activities that support this stage of transition (Daniels, 1996). Thus, it can be assumed that it is within the ZPD that all the concepts linked to cultural-historical activity theories come to the fore. It is where the child orientates himself/herself. Through the teacher and with the support of tools, a child can integrate scientific knowledge with everyday knowledge and become meaningfully situated in the learning process. The ZPD will be expanded on in the ensuing chapters; importantly, through the detailed analysis, it becomes clear how the ZPD plays out when collaborating, interacting, and working with the three Grade R teachers.

1.5.5 Spontaneous and Scientific Concepts

These terms are synonymous with an elaboration of Vygotsky's "double stimulation" method which describes how an educator needs to understand the importance of the interrelatedness of spontaneous (everyday) and scientific knowledge; the educator then ultimately needs to take this understanding and apply this in practice.

Daniels (1996) investigated the *acquisition of knowledge* as defined by Vygotsky and concurred that, for learning to be meaningful requires it to be situated within a dynamic and fluid context in which there is a natural interchange of everyday and scientific concepts. Hedegaard also observed that achievement of this culminates in the learner being able to formulate his or her associations and later apply them in a broader context.

1.6 PRELIMINARY LITERATURE REVIEW

This preliminary literature review plays a role in contextualising this study, which helps situate the research within the existing body of knowledge. In doing so, the preliminary review identifies gaps needing further exploration; moreover, it provides a background to understand the historical and current trends on this topic.

1.6.1 Types of Play

In early childhood development, exposure to various types of play facilitates crucial roles in a child's holistic development (Leong & Bodrova, 2012). Defining and studying types of play is essential for recognising and supporting the multifaceted aspects of child development (El'Konin, 2005). It informs educational practices, supports mental health and well-being, aids in the early identification of developmental issues, and enhances understanding of cultural and social dynamics (Wood, 2009).

Symbolic play, also known as pretend play, involves children using objects, actions, or scenarios to represent something else, reflecting cultural norms and providing opportunities for cultural learning (Excell & Linington, 2020). The capacity to view one object as symbolising another is foundational for literacy and numeracy. Understanding that a written word symbolises a spoken word or that numbers represent quantities is essential for early reading and math skills. Symbolic play therefore fosters these foundational abilities, making it easier for children to grasp more complex concepts as they grow. Lillard (1993) investigated whether pretend play involved advanced cognitive

capabilities and identified three skills shared by both pretend play and cognitive functioning. These involve the ability to perceive one object as embodying two things simultaneously, the capacity to view one object as symbolising another, and the ability to understand and represent mental representations. The ability to perceive one object as embodying two things simultaneously is crucial for abstract thinking. This skill underlies the capacity to understand metaphors, analogies, and various forms of symbolic reasoning. In education, this translates to improved abilities in subjects that require abstract thinking, such as mathematics and science.

Closely associated with this, sociodramatic play involves imaginative role-playing with peers, thereby enhancing social skills, communication, and empathy. Meanwhile, exploratory play encourages curiosity, experimentation, and sensory exploration (Smilansky & Shefatya, 1990; Wood, 2009). By engaging in pretend scenarios, children exercise their creativity, imagining alternative realities and solutions to problems. This creative process is not only a cognitive exercise but also a means of exploring cultural narratives and possibilities. Such play can foster innovative thinking, which is valued in many cultural contexts.

Construction play, in contrast, sees children utilising materials like blocks or Lego to build, and in so doing, fostering spatial awareness, problem-solving skills, and creativity that align with Vygotsky's concept of tool-mediated activity (Vygotsky, 1978). Construction play lays the groundwork for learning in science, technology, engineering, and mathematics (STEM). It encourages curiosity, experimentation, and a hands-on understanding of concepts that are crucial for STEM education (Elkind, 2007; Fler, 2021). Yet another distinct form of play, parallel play occurs when children play alongside each other without interaction, common in toddlers, while cooperative play involves coordinated and mutually beneficial play, promoting teamwork, communication, and problem-solving skills, allowing children to determine outcomes through shared experiences (Wood, 2009).

These types of play offer diverse avenues for children to learn, grow, and interact with their environment and peers, forming essential components of early childhood development. Play performs a crucial role in the development of self-regulation in children. Through play, children learn to manage their emotions, behaviours, and impulses, which are key components of self-regulation. Engaging in imaginative and

cooperative play allows children to practice setting rules, taking turns, and resolving conflicts, thereby enhancing their ability to control their actions and responses (Diamond et al., 2019). This process of self-regulation during play not only fosters social skills but also supports cognitive functions such as attention, problem-solving, and planning, laying a strong foundation for future academic and life success.

1.6.2 Play in Early Childhood Education

As opposed to instruction, play in early childhood education is widely recognised as a spontaneous, voluntary, and intrinsically motivated activity that offers children opportunities for exploration, creativity, imagination, and interaction with their environment and peers (Bonawitz et al., 2011). It is considered fundamental to children’s learning and development across cognitive, social, emotional, and physical domains. Notably, there is no consensus on the definition of play, owing to the fluidity and context-dependant nature it assumes. Wood challenges traditional notions of free choice and free play, arguing that this is rarely the case; Wood thereby highlights the influence of power dynamics and societal norms on children’s play experiences (Wood, 2014). Similarly, substantial literature underscores the importance of striving to value all children’s perspectives on play; this literature connects play with democratic environments and explores its links and influence within pedagogy and curriculum (Fleer, 2011; Hedegaard & Lyberth, 2020; Stetsenko & Ho, 2015b; Van Oers, 2013).

Play is recognised for its extensive and impactful benefits on children’s development, yet it is often separated from learning activities in early childhood education settings (Fleer, 2023; Karlsen & Lekhal, 2019). However, in the context of Grade R in South Africa, continued efforts are being made to integrate play into educational practices and prepare teachers to work effectively with culturally and linguistically diverse learners. Most recently, recommendations tabled in the latest Early Childhood Development (ECD) draft bill, “Children’s Amendment Bill of 2024” emphasise the need for ongoing teacher development and support to address the challenges of working with marginalised learners and diverse communities

1.6.3 Play in Early Childhood Policy and Curriculum

In South Africa, Grade R teaching is a complex and evolving practice that emerged as part of the post-apartheid education reforms. It has aimed to provide early childhood

education opportunities, particularly for children from low socio-economic backgrounds. Before apartheid ended in 1994, ECD in South Africa was largely informal and fragmented. ECD services were predominantly provided by non-governmental organisations (NGOs), community-based organisations (CBOs), and private individuals. The focus was primarily on custodial care rather than structured early learning, with minimal governmental involvement. Health and social welfare departments occasionally contributed through nutritional and health programmes targeting young children (Atmore, 2013). Policy documents such as White Paper 5 have outlined the government's commitment to ECD, including the introduction of Grade R as a compulsory preschool year (Department of Education, 2001). The Tirisano Programme, supported by the Department of Basic Education (DBE), was instrumental in establishing Grade R classes to improve school readiness and facilitate the transition to formal schooling. The recent passage of the Basic Education Laws Amendment (BELA) Bill in 2023 makes Grade R compulsory and shifts decision-making powers regarding school language and admission policies to provincial education heads. In 2012, the CAPS which emphasises play-based learning in early childhood education was introduced. However, particularly for Grade R, this did not outline how play should be managed and promoted and this gap has remained. While CAPS mentions play in various contexts, it lacks specific guidance on the role of the teacher as a mediator of play and how play-based learning should be integrated into the curriculum. This highlights the need for further clarification and support to ensure the effective implementation of play-based approaches in Grade R classrooms.

1.6.4 The Role of Adults in Play

Veresov et al. (2021) explored the challenge of determining the optimal extent and nature of adult involvement in children's play, particularly within the context of the global interest in play-based pedagogy. Through an experimental investigation, they examined how different forms of teacher support during play impact the development of executive functions in early childhood learners. Executive functions, crucial cognitive processes associated with self-regulation, goal-directed behaviour, and effective problem-solving, are essential for managing complex tasks and contributing to overall cognitive flexibility and adaptability. The study reveals that while free play alone does not significantly impact executive function development, child-led play moderately influences inhibitory control and motor persistence, and adult-led play shows a slight positive impact on these

functions. These findings offer valuable insights for shaping educational practices from a cultural-historical perspective, highlighting the potential of play in promoting children's learning and development globally.

1.6.5 Facilitating Emergent Mathematics in Early Childhood Education

Askew et al. (2019) highlight the challenge of underperformance in early mathematics education in South Africa, attributing it to teachers' lack of sound mathematical knowledge, difficulty prioritising important concepts, and challenges in adapting teaching skills to effectively support learners. Baloyi-Mothibeli et al. (2021) add that despite training, teachers often lack qualifications and struggle to select and use learning resources appropriately, compounded by inadequate use of mother tongue in mathematics instruction. Atmore et al. (2012) argue that securing teacher qualifications does not guarantee successful teaching and learning management in Grade R owing to its unique position between ECD and formal schooling. Bezuidenhout (2020) finds that Grade R teachers lack confidence in their abilities and focus on curriculum completion rather than adapting the curriculum to suit the needs of learners, emphasising the need for teacher education programmes to develop pedagogical theories and improve classroom practices.

Recent initiatives like Maths for Primary Teachers (PRimTEd) focus on developing pathways to understanding numbers, drawing from brain science research, while Luneta (2021) advocates for place-based mathematics teaching to contextualise learning. In studying pedagogical content knowledge (PCK), Björklund et al. (2020) discuss the tension between constructing and instructing in early mathematics education. They emphasise the importance of empowering children, language mediation, and parental influence in developing mathematical reasoning and problem-solving strategies.

1.6.6 Emergent Mathematics in CAPS

CAPS emphasises a play-based approach to teaching early childhood mathematics, advocating for teacher mediation and spontaneous learning. It suggests activities ranging from free play to guided activities focused on numeracy, such as measuring during cooking. CAPS outlines three stages of emergent mathematics acquisition and recommends incorporating mathematics into daily routines like the passing of time in the morning ring. It promotes problem-solving, reasoning, and cooperative learning while advocating informal observation-based assessment. The policy stresses flexibility,

aligning with young children's needs rather than a formal Grade 1 classroom structure (DBEa, 2011b).

CAPS advocates an informal approach to assessment in Grade R. It emphasises observation-based assessment rather than formal testing methods. Teachers are encouraged to keep records using checklists and to assess children's progress through continuous observation of their activities and interactions during play-based learning experiences. This approach aligns with the developmental needs of young children and aims to provide a holistic understanding of their learning and development. CAPS underscores the importance of flexibility in assessment practices, allowing teachers to adapt their methods to suit the individual needs of each child and to create an inclusive learning environment (DBEa, 2011b).

1.6.7 Diversity in Early Childhood Education

The Constitution of the Republic of South Africa, 1996, known for its progressiveness, explicitly acknowledges diversity and the importance of inclusive education; it further protects children's rights and cultural identities. Section 28 of this constitution emphasises the best interests of the child and recognises cultural, linguistic, religious, and community identities. Additionally, Section 6 acknowledges linguistic diversity, advocating for the preservation and promotion of various languages. In Grade R classrooms, cultural diversity is evident, requiring teachers to embrace and celebrate differences to create an inclusive learning environment. Penn (1997) highlights the need for greater cultural sensitivity in early childhood programmes, suggesting that Western models may not suit indigenous African cultures. Linington et al. (2011) and Rutgers and Reddy (2013) discuss the importance of developing strong partnerships between teachers and educational institutes to support professional development and cognitive capacity. Regarding language diversity, South Africa's 11 official languages are reflected in Grade R classrooms. Teachers should be sensitive to language differences, supporting learners to develop proficiency in the language of instruction while valuing their home languages. Socio-economic diversity also influences classrooms, with learners from different backgrounds having varying access to resources. Teachers must address potential inequalities, ensuring equal opportunities for all learners. Robinson and Zinn (2007) emphasise the social and pedagogic responsibilities of teachers, advocating diversity

training to promote human dignity, equality, and freedom. Cochran-Smith (2004) underscores the need for teachers to understand the impact of macro issues on local pedagogic interventions and design responsive class activities.

Deeper studies into the pedagogy of play in early childhood education are necessary, as cautioned by Björklund et al. (2020), who stress the uniqueness of researching emergent mathematics. Björklund et al. advise researchers to consider children's varied behaviours during research, advocating for multiple research modes over extensive periods. International research, such as that in Norwegian kindergartens by Karlsen and Lekhal (2019), highlights the significance of play in educational settings. Despite Norwegian schools having curriculum autonomy, there is a lack of supportive interactions during free play, indicating room for improvement in nurturing children's learning. Stetsenko and Ho (2015a) discuss the transformative potential of play, drawing on Bakhtin and Vygotsky's theories to emphasise play as a process of creative transformation and self-authorship. Stetsenko and Ho (2015b) stress the importance of understanding play's richness and value, particularly through interactions between children.

Papandreou and Tsiouli (2022) emphasise the importance of recognising children's everyday mathematics during play and integrating it into the curriculum. Their study in a diverse Greek early childhood class explores children's mathematical knowledge and recommends more responsive curricula that incorporate play-based learning activities. In a similar light, Solis et al. (2017) argue that there needs to be more focus on defining what play looks like in different contexts in order for it to become more accessible. These studies underscore the need to prioritise play in early education and highlight the role of dialogue, relationships, and observation in shaping children's identities and fostering their mathematical thinking.

1.6.8 Conclusion

The preliminary literature review covers various aspects of play and emergent mathematics in early childhood education, emphasising their significance in children's holistic development. It explores different types of play, including symbolic play, construction play, and sociodramatic play, each offering unique benefits for children's cognitive, social, and emotional growth. The review also discusses the role of play in early childhood education, highlighting its importance as a spontaneous and intrinsic

activity that fosters exploration, creativity, and social interaction. Despite the recognised benefits of play, challenges exist in effectively integrating it into educational practices. Additionally, the review describes the role of adults in facilitating play, emphasising the need for teachers to strike a balance between supporting children's play and allowing them autonomy. Furthermore, the review touches upon the emergence of mathematics in early childhood education, stressing the need to recognise and integrate children's everyday mathematical experiences into the curriculum.

There is a substantial need for research that values all children's perspectives on play, ensuring that diverse voices and experiences are represented and acknowledged. This includes investigating how play can be inclusive of different cultural, social, and individual backgrounds. Additionally, research should focus on connecting play with democratic environments, examining how play can contribute to the development of democratic values such as equity, participation, and respect among children. It is also crucial to explore the links and influences of play within pedagogy and curriculum, analysing how play-based learning can be integrated into educational frameworks to enhance cognitive, social, and emotional development. This research could provide insights into the effectiveness of play in fostering critical thinking, creativity, and problem-solving skills, thereby informing educational practices and policies.

Overall, the literature underscores the importance of prioritising play and emergent mathematics in early childhood education, while acknowledging the complexities and challenges involved in their implementation.

1.7 INTRODUCTION TO THE CHAT FRAMEWORK

This preliminary theoretical framework outline serves as a foundational map, delineating the key theoretical perspectives and constructs that will guide the analysis and interpretation. This outline will be meticulously expanded upon in a dedicated chapter, where each component will be elaborated in detail, providing a thorough theoretical underpinning for the empirical investigations that follow.

CHAT is rooted in the works of Vygotsky and seeks to understand human development through the lens of social and cultural influences (Cole & Engeström, 1993; Vygotskiï, 1997; Vygotskiï & Kozulin, 1986). The latter research emphasised the significance of social interactions, cultural context, and historical factors in shaping cognitive processes

and development. Vygotsky's theory challenged traditional views that focused solely on individual abilities, proposing instead that learning and development occur within social interactions and cultural contexts. His work laid the foundation for the sociocultural historical theory, which has since evolved into a prominent framework for understanding human cognition and behaviour.

The primary purpose of CHAT is to reveal the complex interplay between individuals, their social environments, and the cultural tools and practices that mediate their development. This theory suggests that cognitive growth is not solely determined by innate abilities but is deeply intertwined with the sociocultural context in which individuals are situated. By examining how individuals interact with their social and cultural surroundings, sociocultural historical theory aims to uncover the mechanisms through which learning and development occur. It emphasises the importance of language, social interaction, and cultural artefacts in mediating cognitive processes and shaping individuals' understanding of the world.

CHAT explores interaction by way of a model of an activity system which serves as a powerful framework for analysing action change and educational practices. By focusing on the dynamic interactions between subjects, objects, tools, division of labour, and rules, the activity system reveals imbalances that contribute to an unstable activity system. Once these tensions – referred to as contradictions – are revealed, it becomes possible to address the causes of imbalance. In such a way, this theory provides valuable insights into how educational interventions and practices can foster cognitive growth and development. By examining how cultural tools and practices shape individuals' learning experiences, researchers can identify effective strategies for promoting learning and facilitating action change in educational settings.

In CHAT, the subject refers to the individual or group of individuals whose actions and interactions are the focus of analysis. The subject can be a person, a community, an organisation, or any other social entity. The object describes the goal or purpose of the activity in which the subject is engaged. The object mediates the subject's actions and serves as a driving force for their behaviour. Closely related to these two elements are the tools which are represented by the physical and symbolic artefacts, as well as the cultural and technological resources, that individuals use to accomplish their goals and mediate their interactions with the environment. Tools include both tangible objects like

electronic, digital or physical tools and technology, as well as conceptual tools like language and symbols.

CHAT describes how every activity is regulated by rules which are the norms, conventions, and regulations that govern behaviour within a particular activity system. Rules shape individuals' actions and interactions and provide a framework for social organisation and coordination. The community refers to the social context in which the activity takes place, including the various individuals, groups, and institutions that participate in or influence the activity. The community provides the cultural and social resources that support and shape individuals' engagement in the activity. Closely related to this is the division of labour which describes the distribution of roles, responsibilities, and tasks among members of the community or activity system. Division of labour reflects the organisation of social relationships and the allocation of resources within the community (refer to Figure 1.1). Binding these elements together, in CHAT, mediation refers to the process by which individuals use tools, symbols, and cultural artefacts to mediate their interactions with the environment and with other individuals. Mediation plays a central role in shaping cognition, communication, and social interaction within activity systems.

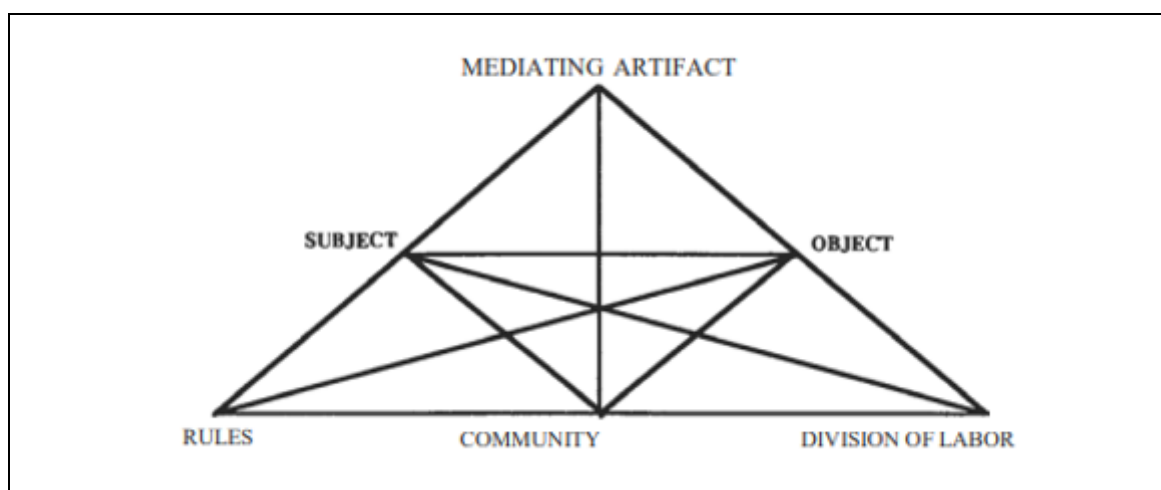


Figure 1.1: The Activity System
Source: (Cole & Engeström, 1993, p. 8)

CHAT underscores the importance of collaborative learning environments, scaffolding, and culturally relevant pedagogical practices in supporting learners' development and enhancing educational outcomes. This theory offers a comprehensive framework for

understanding the complexities of human learning and development within social and cultural contexts, making it invaluable for educational research and practice.

1.8 RESEARCH METHODOLOGY

Sociocultural theories play a pivotal role in bridging cognitive and social learning. This sociocultural study adopts an ethnographic and exploratory approach, rooted in a qualitative, interpretive paradigm, to understand the intersection of play and emergent mathematics pedagogy. The research design aligns with Hedegaard and Fleer's argument that theoretical concepts should underpin the methodology to ensure reliability and validity (Hedegaard & Fleer, 2009).

1.8.1 Research Design

The design of this study is multifaceted, encompassing analytical and interactional perspectives. From an analytical standpoint, the study follows qualitative, ethnographic principles, focusing on descriptive and meaningful analysis of human activity. Qualitative ethnography is a research approach that involves the in-depth study of people and cultures within their natural settings. It typically uses a combination of methods such as participant observation, interviews, and document analysis to understand the complex social phenomena and cultural practices of a particular group. Ethnographic research aims to provide rich, contextualised descriptions and interpretations of social life, often focusing on the subjective experiences and perspectives of participants (Hesse-Biber & Leavy, 2011).

The approach to this study involved gathering the experiences and challenges of Grade R teachers, and even less overtly articulated experiences, to address the research questions guiding this study. As Vygotsky (1997) explained, indirect observation can reveal nuanced aspects of human behaviour. Indirect observation refers to a research method where the researcher gathers information about a subject's behaviour or activities without directly observing them in real time. Instead, an indirect observation often involves analysing secondary sources of data such as records, documents, or artefacts that provide insights into the subject's behaviour or actions. This approach allows researchers to study phenomena that may not be directly observable or to examine behaviours that occur over an extended period (Cohen et al., 2018). This process combines theory and practice,

action, and reflection, echoing Vygotskian principles as demonstrated through CHAT (Hill & Cole, 1995).

The CHAT model highlights this dual nature, capable of examining collective activity systems from both initiative and analytical perspectives. This model allows for the exploration of tensions and imbalances within social settings, providing meaningful insights into the ecosystem of educational environments. Engeström's research underscores the importance of capturing all variables within a dynamic learning setting, a key aspect this study aims to achieve (Engeström, 2011).

In a similar vein, Hedegaard (2016) emphasises the need for a qualitative approach to developmental pedagogy, particularly the implementation of the double stimulation approach. This approach ensures a constant interchange between everyday and scientific knowledge, facilitating effective teaching and learning. Practical fieldwork is essential in this process, enabling researchers to observe and engage with all stakeholders, as Hedegaard (2016) suggests.

The qualitative approach, combined with CHAT, envisages explaining and improving the diverse Grade R context towards a sociocultural model of play-based learning to teach emergent mathematics. Through this approach, knowledge emerges from experiences, fostering a deeper understanding of the interactions between play, emergent mathematics, and the learning environment.

1.8.2 Research Plan

The research plan outlines the comprehensive research process encompassing observation, recommendations, evaluation, and feedback phases to ensure a thorough investigation and meaningful outcomes. The research plan for this study comprised five stages as listed below in Table 1-1.

Table 1.1: Research Plan

<p>Phase 1: Preliminary Observation and Initial Interviews (2022, Term 3)</p> <p>Duration: One full morning per week for the term.</p> <p>Approach: Ethnographic study methodology.</p> <p>Activities: Initial class observations, individual interviews with Grade R teachers after three weeks.</p>

Rationale: Gain a deep understanding of the research problem and establish rapport with participants. Utilise clinical interview techniques for in-depth understanding, to understand the three Grade R teachers' perspectives on teaching emergent mathematics, the role of play, challenges, and support needs.

Phase 2 & 3: Formative Sessions and Recommendations (2022, Term 4)

Start: Beginning of 4th term.

Approach: Guided by the CHAT model.

Activities: Formative focus sessions with teachers to recommend adaptations in teaching and learning spaces.

Rationale: Ensures internal validity and reliability of study. Provides ongoing support and guidance based on initial findings.

Phase 4: Evaluation and Further Support (2022–2023)

Duration: February 2023–September 2023.

Approach: Reflection on previous meetings, tabled discussion points.

Activities: Focus group follow-up meetings.

Phase 5: Feedback and Finalisation (2023-2024)

Start: October 2023.

Activities:

- Feedback sessions in focus group meetings.
- Final observations.

Completion: First quarter of 2024.

Rationale: Gather feedback on implemented changes and ensure comprehensive analysis and reflection for the study.

1.9 THE ROLE OF THE RESEARCHER

The role of the researcher in a qualitative study is multifaceted and dynamic (Hesse-Biber & Leavy, 2011). Through careful observation, thoughtful engagement, and rigorous analysis, the researcher contributed to a deeper understanding of emergent mathematics teaching practices and fostered meaningful improvements in early childhood education. Commitment of the researcher to the research process is integral to the success of the study and cannot be understated, particularly in the field of sociocultural studies where the researcher is immersed in the process (Ryan, 2006).

1.10 RESEARCH SITE AND SELECTION OF PARTICIPANTS

This study focuses on three Grade R teachers in three different Grade R classrooms situated in a diverse primary school in the Cape Metropole. This school was selected using purposive sampling, a non-random sampling method where researchers deliberately select participants based on specific criteria that align with the study's objectives, ensuring a representative and diverse sample (Hesse-Biber & Leavy, 2011). The key criterion for this sampling process was that this school should reflect a diverse composition of backgrounds, ethnicities, genders, cultures, and languages. This is important because diverse backgrounds often mean varying cultural norms, values, and communication styles. Understanding and navigating these differences can be challenging and time-consuming but can lead to understanding or more subtle interpretations among group members (Maxwell & Levitt, 2023). The justification for the selection of these characteristics is that they are accessible criteria that can be determined before beginning the research process.

Since the end of apartheid, schools in South Africa have better reflected the great diversity of our nation; as found in international study findings, all classrooms should be places that encourage more equal opportunities for participation (Linington et al., 2011). This practice is not unique to South Africa, because with the rise in globalisation, schools and research reflect diverse cultures and communities of practice (Janks, 2014). Owing to globalisation and migration, schools are increasingly diverse spaces, reflecting many differences. (Westwood, 2018) argues that while many differences are irrelevant in how they impact learning, some have profound effects; according to Westwood, intelligence, gender, culture, ethnicity, and language are the top five influences.

The school was given a pseudonym and is referred to as Windy Meadows.¹ Quintile ratings were avoided based on research into their accuracy; quintile ratings often being critiqued for being problematic in determining socio-economic statuses (Maistry & Africa, 2020). Windy Meadows is situated in Maitland (a metro-central suburb of Cape

¹ The pseudonym was applied since respecting the ethical guidelines and standards of research is important. Anonymizing the identity of schools aligns with the principles of confidentiality and non-disclosure, promoting ethical research practices. Using pseudonyms for schools helps ensure that the identity of specific institutions is not revealed, preventing potential negative consequences or biases associated with the disclosure of sensitive information. *BERA* (2018)

Town) and is classified as a Section 21² school. It is an English medium co-educational school with 746 learners from nearby informal settlements, with school fees set at R1 400 per annum. Windy Meadows is also described as a commuter school, with most of the learners travelling from informal settlements to former white, coloured, or Indian schools – a phenomenon described by Lemon and Battersby-Lennard (2011, p. 97) as “studying together, living apart”.

In this study, the primary participants are three Grade R teachers, referred to as Teacher A, Teacher M, and Teacher S. In terms of the British Educational Research Association (BERA) standards, pseudonyms need to be assigned to protect all participant identities. The three teachers had differing qualifications and levels of experience, ranging from three years to seven years. At the time of writing, Teacher M was still completing her Bachelor of Education degree via a distance tertiary institution, while Teacher A and Teacher S had three-year diplomas in teaching Grade R.

1.11 DATA COLLECTION PROCEDURES

1.11.1 Data Collection

This study, grounded in the qualitative methodology of the CHAT, sought to understand play and learning in Grade R classrooms in a natural and authentic manner (Cohen, Manion, & Morrison, 2018). Data collection involved direct and indirect observations, video recordings, note-taking, and sampling across three classrooms over a term. These methods were complemented by individual and focus group interviews, fostering a comprehensive understanding of teaching and learning practices.

A significant component of the study was indirect observation, which, as Vygotsky (1978) emphasized, extends beyond visible phenomena to include covert behaviors and developmental changes. This interpretative analytic approach, aligned with hermeneutics (Bezuidenhout et al., 2014), sought to uncover hidden realities and meanings within sociocultural contexts. Observations explored teaching, learning through play, and

² Section 21 schools are permitted to charge school fees and manage their own finances and decision-making related to the running costs of the school, selection of subjects, and extra murals. (Constitution of South Africa, 1996)

institutional practices, adhering to a fluid, adaptive approach (Hesse-Biber & Leavy, 2011).

Interviews were conducted in a non-judgmental environment to build rapport and utilized Luria's (1976) clinical interview method with probing questions to delve into deeper meanings. The double stimulation method further enabled a transformation of concrete understanding into abstract concepts. Artefacts such as manipulatives, workbooks, and posters were analyzed as central psychological tools, in line with Cole and Engeström's activity system (1993).

The interview approach required a non-judgemental space where a rapport was developed with the subjects; once rapport was established, appropriate probing was posed using in-depth questions as demonstrated by Luria (1976) in his clinical interview approach. This approach advocates the strategy of using probing questions thoughtfully delivered to "drill down" for meaning. Of, additional interest, Luria acknowledges the importance of inserting the double stimulation method to allow for the transformation of functional (concrete) understanding into more graphical (abstract) states. Thus, this process will also include extensive sampling of manipulatives, workbooks, and posters (all artefacts and psychological tools) and these will form the basis for the initial and subsequent analysis. It is of significance to note that these tools are central to psychological processes and are represented at the apex of Cole and Engeström's activity system (Cole & Engeström, 1993).

In terms of sequencing, the data collection was done in five stages in alignment with the research plan. Stage 1 consisted of extensive class observations, followed up by individual teacher interviews, Stage 2 involved analysis of the observations and thematic coding of the interviews, Stage 3 consisted of follow-up interviews and further observations, Stage 4 included focus group interviews and subsequent class observations and document analysis, and Stage 5 concluded with transcription of findings and completion of the thesis findings and recommendations.

The storage of data was an important consideration in this study because, in line with ethical requirements, this aspect needs to be well accounted for in educational research (Hammersley & Trainou, 2012). All recorded data was password-protected and was

exclusively electronically stored using Microsoft Azure,³ the latter is a suitable database for securely storing electronic data. This application utilises scheduled backups should any data be lost by accident.

1.11.2 Data Analysis

The study focuses on data analysis within the framework of sociocultural theory, particularly CHAT, emphasising mediation through interaction and cultural tools. The analysis aims to identify and extract contradictions in the data to guide the study's trajectory. The analysis involves thematic analysis of observations and interviews, with a focus on understanding activity systems and identifying contradictions within the Grade R setting. The contradictions identified inform subsequent interview processes with Grade R teachers. The contradictions appeared through linguistic clues, both in observed lessons and also emerging from the interviews. This approach aligns with developmental didactics and qualitative studies that focus on inferences as a means of diagnosing instability (Maxwell, 2021a). Additionally, the analysis recognises and considers the motives of participants within the activity system, as suggested when viewing behaviour from a sociocultural perspective Hedegaard (1996).

The analysis, guided by the CHAT paradigm of this study, was essential and assumed the crucial role of locating and extracting contradictions in the data to orientate, organise, and direct the trajectory of this study. Upon reflection, the observations (the observed and inferred) were transcribed and subsequently underwent a thematic analysis, whereby constantly seeking to understand the activity system as a whole and specifically, contradictions impeding it. This stage of the analysis was supported by “inserting” the findings into the activity system's framework for greater clarity and meaning.

1.12 ETHICAL CONSIDERATIONS

According to guidelines on ethnographic work, written approval was obtained to ensure that no person was in any way negatively impacted by this study – either directly or indirectly (Bezuidenhout et al., 2014). Important aspects relating to ethics link to the outlining of processes, obtaining informed consent from all participants, and importantly, assuring parties of anonymity and confidentiality (Cohen et al., 2007). This commenced

³ This is a Microsoft product offering safe and secure cloud storage with backup

with obtaining ethical clearance from the University of Pretoria's Ethical Committee. Part of this application process included a summary of the study's approved research proposal, and cover letters, including the one for the Western Cape Education Department (WCED) and the selected school (refer to Appendices A–F). Details regarding the nature of the research fieldwork, and procedures relating to the research such as timing and duration were outlined, and emphasis was placed on being open and transparent regarding the research process to avoid any confusion and lack of understanding.

Schoenfeld (1999) explains that there is evidence in the literature of teachers being critiqued by people being allowed into their classroom settings and resultantly, are often reluctant to expose themselves as part of the selection process. Therefore it was vital to assure participants of their anonymity and explain how their willingness to participate in this study was respected and valued (Schoenfeld, 1999b).

Once the researcher had obtained the ethical clearance certification from the University of Pretoria, the Western Cape Education Department was approached and was provided with relevant documentation including certification from the university. Careful consideration was demonstrated regarding dates of visits so as not to disrupt any assessment times in the various schools.

Finally, the principals and Grade R teachers were approached with all the approvals for final informed consent. This is vitally important as the principals and teachers bear the responsibility of *loco parentis*, that is, being legally responsible for the learners within the various school communities according to the fundamental children's rights in the Constitution of South Africa, 1996. Furthermore, in South Africa, any research involving children is governed by the norms and laws set out in the National Health Act 61 of 2003 (NHA), which stipulates mandatory parental or legal guardian consent for all children under the age of 18 years. The information provided to all parties approving the research must show that there is minimal risk to the learners, with all identities protected (refer to Appendix E). In terms of fundamental ethical principles underpinning educational research, details such as the assurance of not revealing the learners' names, faces, or identities must be explicitly mentioned (Cohen et al., 2018).

1.13 OUTLINE OF CHAPTERS

This thesis is organised into distinct chapters, each contributing to a comprehensive understanding of the study's focal points. Chapter 2 provides a thorough literature review by way of a comprehensive examination of the literature, synthesising existing research on play, mathematics, and cultural-historical activity. Chapter 3 details the theoretical foundation for the study, whereafter Chapter 4 outlines the research methodology, detailing the selection of participants, data collection methods, and analytical tools. Chapter 5 then presents the empirical findings and their analysis, shedding light on the intricate dynamics in the facilitation of play and mathematics within early childhood education. Chapter 6 provides a summary of each chapter, discusses the implications of the study and proposes recommendations for educational practice.

1.14 SUMMARY

This chapter offered a comprehensive overview of the study, encompassing its aims, objectives, and research questions. It also provided initial concept clarification, a review of relevant literature, and established the theoretical framework. Furthermore, it delineated the research paradigm guiding the project and outlined the data collection methods employed. The subsequent chapter covers a thorough literature review on key topics pertinent to the study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter provided a comprehensive overview of the research study and also outlined some of the key literature and theory, laying the groundwork for a deeper exploration in later chapters. This chapter fulfils several key aims linked to this study. In order to establish context, it provides background information and framing, and in doing so, situates it within the existing body of work. This encompasses play-based pedagogy, emergent mathematics, early numeracy skills, diverse classrooms, and research exploring the application of CHAT in educational settings. Additionally, this chapter highlights major trends and arguments within the field, offering a balanced perspective on different viewpoints and approaches. In tandem with highlighting the important work done to date, the chapter identifies gaps in the research. In doing so, the chapter highlights areas that need further investigation and demonstrates the relevance and significance of this study.

Drawing from a wide selection of literature to broadly delineate the study, the ensuing sections provide a discussion on the complex nature of this field of research, and through the process, justify the need for more focused research into the nature of play and further emancipatory and expansive sociocultural research in this area. The literature review is structured into four sections, namely, the pedagogy of play, emergent mathematics in early childhood education, implementing Grade R in diverse classrooms in South Africa, and lastly, the intersection of the aforementioned topics. Additionally, sub-sections shed light on the current state of knowledge of emergent mathematics and the pedagogy of play, provide the historical context to this topic and importantly, expose the knowledge gap that needs to be explored further to address the research aims and objectives of this study.

2.2 THE PEDAGOGY OF PLAY

The pedagogy of play represents a cornerstone of early childhood education, emphasising the critical role of play in fostering children's cognitive, social, and emotional development. The exploration of the use of play as a cognitive tool has resulted in a proliferation of the literature on ECD, with an emphasis on the interdependence of words

and mental processes. Using play as a means of active engagement and learning is strongly advocated by experts such as Griffiths (1988), Smilansky and Shefatya (1990) and Wood (2009). Play is described as a vehicle for assessing, supporting, and promoting learning whereby children exercise their agency and demonstrate how abstract mathematical processes can be located in concrete situations through imagination and discussion brought about through play.

This section of the literature review aims to explore the multifaceted nature of play-based learning, examining its foundations and practical applications. By examining the various types of play, this review will provide a comprehensive understanding of how each type contributes uniquely to early learning experiences. Through an analysis of existing research, the review will highlight the benefits, challenges, and implications of integrating diverse play-based approaches in educational settings, offering valuable insights for teachers and policymakers dedicated to enhancing early childhood education.

2.2.1 Types of Play

In ECD, play is a critical aspect that supports children's physical, cognitive, social, and emotional development. There are several types of play commonly observed in young children that together contribute to the holistic development of a child (Excell & Linington, 2020).

2.2.1.1 Symbolic Play

Symbolic play, often referred to as pretend play, involves children using objects, actions, or scenarios to represent something else. For example, a child might pretend to be a doctor, using a toy stethoscope and bandages to treat a stuffed animal (Wood, 2009). Vygotsky emphasised the influence of cultural context on children's development, including their play experiences. Pretend play reflects cultural norms, values, and practices, as children often incorporate elements from their social environment into their imaginative play scenarios. Cultural artefacts, such as toys, books, and media, shape the content and themes of pretend play, providing children with opportunities to explore and internalise cultural knowledge (Vygotsky, 1978).

2.2.1.2 Construction Play

Constructive play involves children using materials such as blocks, Lego, or clay to build or create something. This type of play enhances spatial awareness, problem-solving skills, and creativity (Linington et al., 2011). Construction play provides children with opportunities to interact with various materials and tools, allowing them to explore properties, experiment with different configurations, and solve problems through hands-on manipulation. Through constructive play, children learn how to use tools and materials as mediators for thinking and problem-solving, which is central to Vygotsky's concept of tool-mediated activity (Vygotsky, 1978).

2.2.1.3 Sociodramatic Play

Sociodramatic play occurs when children engage in imaginative play together, often assuming roles, and interacting with peers to create complex scenarios (Samuelsson & Carlsson, 2008). This type of play fosters social skills, communication, cooperation, and empathy. Sociodramatic play promotes social interaction, cooperation, and collaboration among children as they work together to create and sustain imaginary worlds and narratives.

In a study aimed at promoting greater gender equity, Fleer (2021) study created a virtual play world where the young female participants focused on a pretend scenario of being “scientists” and “engineers”. The outcome of the study showed a breakdown of preconceived gender barriers where the participants engaged meaningfully in activities that still predominantly have a history of being male-dominated.

Lillard (1993) underscores the importance of pretend play in fostering cognitive and social skills, providing a rich context for language development, problem-solving, and emotional regulation. Studies emphasise the importance of social play in children's development of interpersonal skills, such as sharing, taking turns, resolving conflicts, and empathising with others. Through sociodramatic play, children are provided with opportunities to develop self-regulation, practice, and as illustrated by Bodrova and Leong (2015), in cases, test social roles, norms, and conventions in a playful and supportive context. This fosters their social competence and emotional intelligence (Bodrova et al., 2013; Diamond et al., 2019).

2.2.1.4 Exploratory Play

Exploratory play involves children actively investigating and manipulating objects or materials to understand their properties, functions, and possibilities. This type of play is characterised by a child's innate curiosity and desire to make sense of the world around them (Excell & Linington, 2020). During exploratory play, children engage in activities such as touching, tasting, shaking, and disassembling objects, which allows them to gather sensory information and develop their cognitive and motor skills. This hands-on approach encourages experimentation and discovery, fostering critical thinking and problem-solving abilities (Smilansky & Shefatya, 1990). Through exploratory play, children learn to ask questions, make predictions, and test their ideas, thereby building a foundation for scientific thinking and enquiry. Additionally, this type of play supports sensory development as children experience different textures, shapes, colours, and sounds. By promoting curiosity and a sense of wonder, exploratory play helps children develop a lifelong love of learning and an enthusiasm for exploring their environment (Veraksa et al., 2022).

2.2.1.5 Parallel Play

Parallel play occurs when children play alongside each other without direct interaction or collaboration. While they may be engaged in similar activities, they maintain individual focus and do not necessarily engage in social exchange. Parallel play is common in toddlers and young preschoolers and is normally outgrown by age five (Wood, 2009).

2.2.1.6 Cooperative Play

Cooperative play involves children playing together in a coordinated and mutually beneficial manner. They share goals, negotiate roles, and collaborate to achieve a common objective (Wood, 2009). As children share goals, negotiate roles, and collaborate to achieve common objectives, they develop critical social and cognitive skills. Cooperative play promotes teamwork, communication, problem-solving, and social skills, where children are provided with opportunities to determine the outcomes of their lived and shared experiences (Stetsenko & Ho, 2015a). Through this collaborative process, children learn to appreciate diverse perspectives and develop empathy, understanding the importance of cooperation and mutual respect. These interactions lay

the groundwork for positive social relationships, as children practice conflict resolution and develop a sense of community and belonging.

Furthermore, the skills acquired through cooperative play have long-term benefits, extending beyond the early childhood years. The ability to work effectively with others, communicate clearly, and navigate social dynamics is crucial for success in school, the workplace, and broader society. By fostering these competencies, cooperative play contributes to the overall development of well-rounded, socially adept individuals capable of contributing positively to their communities.

Defining and studying types of play is essential for recognising and supporting the multifaceted aspects of child development. It informs educational practices, supports mental health and well-being, aids in early identification of developmental issues, and enhances, explores and questions the understanding of cultural and social dynamics. By appreciating the diverse roles of play, teachers, parents, and policymakers can create environments that nurture and support the holistic growth of children.

2.2.2 The Role of Play

Although play is widely written about, there is still little consensus in terms of defining play. Wood (2014) challenges the traditional understanding of free choice and free play in early childhood education as well as activity-based play interests, arguing that institutional and policy versions of free choice and free play provide socially approved (and restricted) opportunities for children's agency. Wood suggests that this potentially limits the benefits of play. Further, her findings suggest that children's choices are influenced by conflicts and negotiations in power relationships, allowing for both group and individual agency through negotiating power dynamics in play such as parallel play and pretend play.

In the context of early childhood education, play is often described as a spontaneous, voluntary, and intrinsically motivated activity that provides opportunities for children to explore, create, imagine, and interact with their environment and peers. Play is considered a natural and fundamental way through which young children learn and develop essential skills. It can take various forms, including physical play, imaginative or pretend play, social play, and constructive play (Hedegaard & Fleer, 2009). The definition of play in

early childhood education emphasises its holistic role in fostering cognitive, social, emotional, and physical development in children (Samuelsson & Carlsson, 2008).

El'Konin (2005) explains that the primary and defining aspect of play involves the imagination of a scenario where a child assumes an adult role and enacts it within a self-created play setting and in such a manner, acquires life competencies. This imaginative scenario involves assigning new meanings to objects and mimicking the actions of the chosen adult role, albeit in a simplified form. Such imaginative play is facilitated by the ability of preschool-aged children to separate visual perception from sensory experience. This ability allows them to engage in imaginative play, where they can create scenarios based on visual input, without being entirely bound by their sensory experiences. It suggests a developmental milestone in cognitive and perceptual abilities in children of that age group. Furthermore, El'Konin (1999) describes how, through play, the collective imagination is harnessed, and children orientate themselves towards activities that are new and not yet realised.

Excell and Linington (2020) describe the benefits of play in early childhood as extensive and impactful, influencing various aspects of a child's development, including cognitive, social, emotional, physical, and language domains. This emphasises the need to recognise and support the importance of play to enrich the child and provide developmentally appropriate early childhood experiences. Substantial research supports the notion of valuing perspectives on play in promoting children's agency, connecting play with democratic environments, and calling for more research into its links with pedagogy and curriculum (Fleer, 2011; Hedegaard & Munk, 2019; Stetsenko & Ho, 2015b).

However, Nilsson et al. (2018) argue that play is often associated with children, while learning is typically thought of as something brought about by adults. In early childhood education, play and learning are often separated in terms of time and space. Activities like circle time, literacy and numeracy lessons, and creative artwork are seen as instructional practices that promote learning. Play, on the other hand, is often set aside for leisure time or outdoor time and is seen as something children do on their own.

Play often involves the exploration of cultural themes, values, and norms. Through role-playing and exposure to diverse play materials, children can develop an appreciation for cultural diversity. Ball (2000) discusses the importance of also preparing teachers to work

with culturally and linguistically diverse learners. In a cross-national study between America and South Africa, Ball (2000) explored the use of activity theory to understand how teachers' commitment is developed through classroom activities and discourse practices. The findings suggest that teacher education programmes should focus on providing activities that engage teachers socially and cognitively on how they can move towards transformative engagements, with a strong focus on discourse analysis. The recommendations also acknowledge the inherited challenges that many teachers still face in South Africa, emphasising the need for ongoing teacher development and support for working with marginalised learners and diverse communities.

2.2.3 The Role of Adults in Play

Veresov et al. (2021) propose that, given the global surge in interest in play-based pedagogy, a major challenge lies in determining the optimal extent and nature of adult involvement in children's play. In this light, they argue that the cultural-historical approach serves as a robust theoretical framework for analysing play experiences. Their research describes the influence of teacher support during play and the positive effect this can have on the development of executive functions in early childhood learners.

Executive functions refer to a set of cognitive processes and skills that are essential for self-regulation, goal-directed behaviour, and effective problem-solving (Christensen, 1979). These functions, primarily associated with the prefrontal cortex of the brain, include abilities such as planning, organising, initiating tasks, sustaining attention, regulating emotions, adapting to changing situations, and exercising inhibitory control whereby suppressing impulsive actions (Van der Sluis et al., 2007). Executive functions play a crucial role in managing complex tasks, making decisions, and navigating various aspects of daily life, contributing significantly to overall cognitive flexibility and adaptability (Zelazo & Müller, 2002).

Brofman et al. (2020) discuss the Vygotskian perspective on early childhood education as being grounded in Vygotsky's overarching belief that children's learning and development are primarily shaped by mediation. This entails involving children in activities suitable for their age, such as emotional interactions during infancy, play-oriented engagements during preschool years, academic learning in middle childhood, and social interaction with peers in adolescence. Within these activities, adults facilitate

children's acquisition of new cognitive tools for problem-solving and self-regulation. Initially, these tools are provided externally; for instance, a parent might tie a string around a child's finger as a reminder to buy bread. As children become proficient with these tools, they internalise them, transforming them into internal mediators of their mental processes. In the case mentioned, the child might adopt mental mnemonics as an internalised memory aid.

In their study, Veresov et al. (2021) introduced different experimental conditions, varying the teacher's role from non-participation to the full organisation of the play. Results indicate that free play does not impact executive function development, whereas child-led play moderately influences inhibitory control and motor persistence. Additionally, adult-led play exhibits a slight positive impact on these executive functions. These findings contribute valuable insights for shaping educational practices within a cultural-historical perspective, thereby leveraging the potential of play in children's learning and development globally.

2.3 EMERGENT MATHEMATICS IN EARLY CHILDHOOD EDUCATION

Emergent mathematics in early childhood education refers to the natural and spontaneous development of mathematical concepts and skills that occur in young children as they interact with their environment, learning through play, exploration, and hands-on experiences rather than formal instruction (Davis & Renert, 2013; Excell & Linington, 2022).

In this section the focus is structured on three areas: first, the section highlights how children learn mathematical concepts and then second, the principles and strategies for promoting emergent mathematics in Grade R classrooms, considering the diverse backgrounds of learners within a South African context. Lastly, the section concludes with a critical commentary on how this emergent mathematics is managed with a specific mention of the role of the teacher by looking at recent research studies as well as CAPS.

2.4 How Children Learn Mathematics

Dehaene (2011) describes number sense as still emerging in terms of its definition but suggests that number sense refers broadly to a child's fluidity and flexibility in using and manipulating numbers, an almost intuitive sense of what numbers mean, and an ability to

perform mental mathematics and look at the context and make quantitative comparisons without difficulty. Many studies indicate that children are born with an innate number sense (Butterworth, 2018; Dehaene, 2011), in other words, a predisposition for making quantitative distinctions yet they also show that children display an inability to develop a refined understanding of numbers. Thus, being able to make sense of numbers has been implicated as a key predictor of later mathematics difficulties (Askew & Brown, 2003). Often, those who teach mathematics to young children, as well as those who develop curricula for teaching numbers and basic arithmetic concepts to kindergartners, fail to fully take into account (Chard et al., 2008)

Gallistel and Gelman (1986) describe the innate, preverbal system of counting and arithmetic reasoning as revealed by experiments on numerical representations in animals. They assert the following: preverbal counting serves as the foundation for embedded principles guiding the achievement of verbal counting and establishes the groundwork for integrating the verbal system. Thus the process of learning to count encompasses grasping a correlation from preverbal numerical magnitudes to verbal and written number symbols, and vice versa.

Additionally, Gallistel and Gelman (1986) highlight the role of subitising, describing how it involves utilising the preverbal counting process and mapping the resulting magnitudes to number words for quickly identifying small numbers. This then leads to the retrieving of number facts, crucial in verbal computation, which is facilitated through backwards and forwards fluid use. This applies to verbal and written numbers, as well as to preverbal skills and the utilising of multiple representations of numbers.

Similarly, in their research with initial teacher education (ITE) and emergent number sense, Roberts and Porteus (2023) recognise the inherent preverbal competencies that children are born with, describing these competencies as “mathematical starter kits” (Roberts et al., 2023, p. 8). They demonstrate how through games and play (such as *veza* a Xhosa word which means show), teachers can build on the inherent knowledge to encourage learners to subitise, both perceptually (initial glance) and conceptually by combining two or more groups of numbers. Furthermore, their work draws on multiple studies culminating in the notion that emergent number sense can be enhanced and that there are two strong pathways to developing number sense, namely: the counting pathway and the measurement pathway.

Drawing on everyday knowledge by using a container of tomatoes as a metaphor, Roberts and Porteus (2023) describe how the container of tomatoes can represent a set of items to be counted. They then describe how these items can be represented by drawings, which over time (and guided by the teacher) can become more complex. Drawings move from being unstructured to medium-structured pictures of ten and ultimately large number pictures including 100s (refer to Figure 2.1).

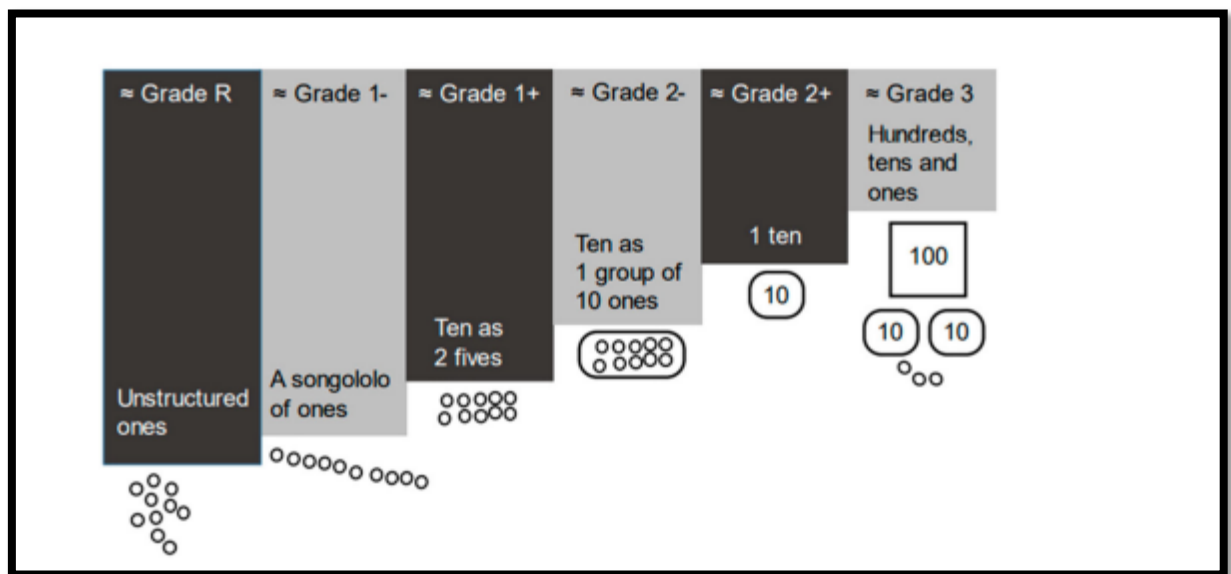


Figure 2.1: The Counting Pathway Source: Porteus and Roberts, (2023)

Roberts and Porteus (2023) provide valuable insight into the effectiveness of utilising number lines over time. They argue that through early and consistent exposure to number lines, children can smoothly transition from whole numbers to real numbers. The structure and utility of a number line, representing continuous movement carries far in terms of conceptual groundwork laying strong pathways for later number work. Moreover, a number line serves as the foundational tool for understanding the Cartesian plane, making it a versatile representation applicable from primary to secondary education and beyond.

To introduce the measurement pathway, they have arrived at a simple metaphor of a person walking along a path, measuring their progress in steps. This metaphorical representation aids in understanding ordinality within the context of a continuous path, where equal steps serve as units of measure. These steps are arranged sequentially, radiating from the starting point (zero). The imagery of a person walking along a path

serves as a practical mental model for children to grasp ordinal counting, emphasising the importance of numerical order.

Naudé et al. (2019) emphasise that initial emergent mathematical experiences need learners to engage in activities that involve counting, sorting, matching, and informal measuring in the context of the real world where mathematical concepts are connected to their everyday experiences. This requires “hands-on exploration” such as manipulating objects and engaging in hands-on activities that help children develop a concrete understanding of mathematical concepts. Emergent Mathematics encourages problem-solving skills as children encounter challenges in their play or daily activities, they naturally develop problem-solving strategies. This can involve figuring out how many blocks are needed to build a tower or how to share toys among friends (Mason & Johnson-Wilder, 2004).

Mathematics is often learned through social interactions. Collaborative play and discussions with peers and practitioners allow children to express and share their mathematical thinking. Group activities can also foster a sense of community and cooperation (Naudé et al., 2019). However, Naudé et al. (2019) emphasise while emergent mathematics is driven by children’s interests and exploration, teachers play a crucial role in facilitating learning. They must actively observe and extend children’s play, ask open-ended questions, and provide materials that stimulate mathematical thinking.

Research into the factors influencing emergent mathematical thinking has been researched and debated extensively with widespread empirical research supporting the idea that a sound number concept is an essential part of mathematics (Askew, 2015). Many studies demonstrate that numeracy is influenced by factors such as age, language, and social contexts (Nelissen, 2018), whereby diminishing the strength of the argument that mathematical thinking is innate. Siemon (2003) suggests that numeracy involves the utilisation of mathematics in a wide range of contexts and extends to real-life situations beyond the classroom and describes the capacity of being numerate as that of displaying confidence and fluency in mathematical skills and number sense that allows the learner to make decisions and think critically.

In a meta-analysis study, Björklund et al. (2020) share key findings from three international conference proceedings at which emergent mathematics was the key topic.

Two prominent themes included children's learning through play and concerns about applying content-focused teaching too soon. Research presentations centred on children's mathematical thinking and learning, specifically in the areas of emerging number knowledge and patterns. In their reported findings, Björklund et al. (2020) describe how these studies analysed how children perceive number structure. and also how this manifests in their structuring abilities. This also applies to the acknowledgement of (and emphasis on) finger patterns, gestures, and body-based communication in facilitating number learning. The discussions also highlighted the significance of children's learning through both free and guided play, with findings emphasising that teachers' guided interactions during play contribute to deeper mathematical thinking and engagement. Importantly, the research underscored the importance of the actions of teachers and the learning opportunities teachers create, calling for increased attention to such aspects. The research findings pushed strongly against the notion of completely unstructured free play towards more guided free play.

An exploratory study in South Africa, based on empirical evidence extracted from the Trend in International Mathematics and Science Study, investigated the role of home-based and caregivers, pre-Grade 1 and this influence on Mathematics performance in Grade 5. Using a process of multiple regression analysis, which pinpoints the strongest correlations, Visser et al. (2019) were able to establish which predictors were likely to influence later success. The results of this stepwise analysis indicated that playing games and playing with toys had the highest association, followed closely by numeracy exposure in Grade R. Similarly, Visser et al. (2019) describes similar studies linked to emergent numeracy and refers to a study on the impact of linear board games by Ramani et al. (2012) where their findings suggest that playing the aforementioned games boosted number identification, estimation, counting, comparison, and many more conceptual elements underpinning mathematical. What remains unclear, and needs more research, is the role that the teacher assumes in mediating and supporting these processes within the classroom setting.

In contrast to the aforementioned literature, Coles and Sinclair (2019) propose a novel perspective on ritual within Mathematics education, diverging from the prevalent notions of acting and thinking, they advocate for an ownership of rituals, termed "ritualisation". Focusing on early number work, they contend that ritualisation holds significance beyond

mere repetitive action, especially within symbolically structured mathematical environments. They assert that ritualisation enables entry into new areas of activity without needing to undergo a phase of thoughtless performance. Coles and Sinclair (2019) advocate for reconceptualising ritual within the mathematics classroom as “ritualisation”, emphasising repetition, symbolically structured settings, and minimal effort to articulate the underlying discourse. *Ritualisation* prioritises certain activities without implying thoughtlessness, mechanical action, or blind obedience to authority.

2.4.1 How the Facilitation of Emergent Mathematics is Conceptualised

Askew et al. (2019) argue that the underperformance in Mathematics in the early years of scale systemic testing in South Africa could be influenced by the lack of sound mathematical knowledge on the part of teachers in the formative grades, who have difficulty prioritising what is important as well as adapting their skills to support the learners. In the same vein, Baloyi-Mothibeli et al. (2021) observe that, despite training and workshops, teachers are not able to manage as they are often unqualified, or partially qualified. They also lack the knowledge of how to select and appropriately use learning resources. Baloyi-Mothibeli et al. add that this situation is compounded by the absence of (or inadequate use of) mother-tongue languages during mathematics instruction.

These documented concerns on Grade R teacher qualifications are not new occurrences and date back to the introduction of Grade R, Atmore et al. (2012) argue, when describing some of the challenges facing the ECD in South Africa. He argues that even securing a teacher qualification is no guarantee of translating into successfully managing teaching and learning, owing to the uniqueness of this grade being straddled between ECD and formal schooling. Additionally, the study emphasises that training needs to be accompanied by practical demonstrations, on-site support, and ongoing follow-up support.

Bezuidenhout (2020) conducted research through individual interviews with Grade R and Grade 1 teachers. Bezuidenhout explored through discussion the development of numeracy skills in young children, and the impact of language and executive functions on their mathematical abilities. The findings showed that teachers had some understanding of the interface between Grade R children’s learning and Grade 1 mathematics concept development. However, they had not yet developed personal

pedagogical theories for integrating these concepts. In particular, the Grade R teachers were reluctant to discuss their adaptations of the curriculum-informed practices that they followed; they were mainly focused on “getting through the curriculum”, rather than reconceptualising it to suit the needs of the contexts in which they taught. Data obtained through individual interviews revealed that some teachers displayed a lack of confidence in their abilities and knowledge, while others said that they were obliged to teach for outcomes due to assessment deadlines.

Additionally, the Bezuidenhout study highlights the role of language in mathematics learning, particularly in a multilingual classroom, and how cognitive flexibility and working memory are necessary for navigating different languages. The article concludes by suggesting the need for teacher education programmes to focus on developing teachers’ pedagogical theories and improving classroom teaching practices. The analysis revealed that the teacher’s practices were manifestations of their beliefs and there were some grave underlying contextual factors contributing to how they viewed their roles as professionals (Bezuidenhout, 2020).

Hazell et al. (2019) in their project evaluating the impact of Grade R mathematics in two of the eight districts in the Western Cape, had similar findings to Bezuidenhout (2020). Hazell et al. used the Marko-D test of mathematical competencies, an individual oral test that measures early number concept development, to assess the learners. It is administered in the language of instruction of the school and has been validated with South African learners in multiple languages. The test can also be used to assess the effects of an intervention by administering it before and after the intervention. The intervention was implemented through a modified cascade model,⁴ with training provided to subject advisors and then passed on to Grade R teachers.

The Hazell et al. (2019) project aimed to upskill subject advisors and teachers in mathematics content and methodology and provide them with resources to deliver interactive and age-appropriate lessons. The intervention included cluster workshops, training sessions, and support through WhatsApp chat groups. Teachers/practitioners received cluster workshops, block training, and additional support. After the training,

⁴ A modified cascade model which includes some elements of Fleisch’s “educational triple cocktail” (structured learning materials, teacher training, and support) Fleisch, B. (2018). *The education triple cocktail: System-wide instructional reform in South Africa*. UCT Press/Juta and Company (Pty) Ltd.

teachers/practitioners were expected to implement the project's content and pedagogical ideas in their classrooms. The study compared the performance of learners in the intervention group to a comparison group and found that the intervention group performed better in mathematical competencies. The findings highlight the importance of language and district in influencing performance. The article further identifies promising levers for change, such as targeted teacher training and support, pedagogical interventions, and the provision of learning materials; it also suggests further research is needed to assess the long-term impact of teacher interventions and explore contextual factors that may influence effectiveness.

Similarly, effective numeracy teaching should take learners' contexts into account as described by Luneta (2021): Luneta's research into the teaching of mathematics in sub-Saharan Africa suggests that place-based mathematics is required for learners to be contextually situated within classroom settings. He calls for teaching that uses modelling of place-based materials, and resources, and that additionally, teachers connect instruction with local issues within their immediate communities (Luneta, 2021). Thus, it is clear that teaching numeracy is a dynamic and contextually-bound activity. It requires the teacher to have a strong and theoretically grounded conceptual understanding of number, and most importantly, the teacher needs to show experience and insight into how best to apply this understanding.

Substantial literature highlights the multifaceted reasons behind poor performance in mathematics within the South African education system, with a growing focus on emergent mathematics and the role that the teacher plays in nurturing the attainment of a strong number concept (Spaull & Taylor; Taylor, 2021; Venkat & Roberts, 2022).

In response to these findings, several initiatives have evolved that aim at addressing teacher performance such as Maths4Primary Teachers. The latter project stemmed from the recognition of the critical need to enhance mathematics education for primary school teachers, and specifically, to address initial teachers' knowledge while they are still at university. It was born out of a collaborative effort between educational experts, curriculum developers, and stakeholders in the field of primary education. The initiative was driven by a deep-seated acknowledgement of the pivotal role mathematics plays in the foundational development of learners' academic abilities.

Recent initiatives by PRimTEd to support teachers in ensuring the effective uptake of emergent mathematics have demonstrated the importance of the development of two “pathways” to understanding number: i) counting discrete objects, and ii) continuous measurement (Roberts et al., 2023). Drawing from international brain science research conducted by Lakoff and Núñez (2000) to describe how mathematical understanding underpins everyday experiences, Roberts (2016) illustrates the importance of arriving at a sense of numeracy that is conceptually grounded. Roberts describes how discrete counting, using the container metaphor schema and continuous measurement utilising the source–path schema together form part of an embodied understanding of number.

Taylor (2021) proposed that poor ITE and below-average learning outcomes lead to diminished teacher esteem. His study puts forward three approaches to enhance teaching and learning: i) enhanced ITE; ii) robust continuous professional development (CPD); and iii) ongoing teacher management and support. The study’s findings underscore the interconnectedness of ITE, CPD, and teacher management and support in reforming South African education. Addressing deficiencies in ITE programmes and aligning CPD initiatives with comprehensive reforms are essential steps towards enhancing teacher competency and learner outcomes in mathematics. Taylor’s study highlights the need for providing teachers with adequate support, mentorship, and resources. He sees these factors to be essential for fostering an environment conducive to learning and promoting professional growth. He further proposes that by investing in full reforms in ITE, South Africa can lay the groundwork for sustainable improvements in initial teacher and teacher education and consequently, achievement in mathematics.

Björklund et al. (2020) raise a critical question regarding the tension between two opposing forces, namely, instructing versus constructing. Their study emphasised understanding the balance between instruction and construction in early learning, particularly regarding how and to what extent children should be taught mathematics before formal schooling begins. Key findings highlight the significant role of language in developing reasoning skills, the influence of parents and caregivers in fostering problem-solving strategies, and the central importance of empowering children through these educational experiences.

The conceptualisation of early-grade mathematics teaching in South Africa involves navigating significant challenges related to teacher knowledge, training, and

contextualised teaching practices. There is a critical need for comprehensive support systems, practical training, and the development of strong pedagogical theories to improve mathematics education. Addressing these issues through targeted initiatives, collaboration, and reforms can help bridge the gap between theory and practice, ultimately enhancing the quality of early mathematics education in South Africa. The importance of mother language and context-specific factors in influencing performance was also articulated by Björklund et al. (2020) emphasising that more needs to be done in order for mathematics teaching to be fully inclusive and decolonised.

2.4.2 Emergent Mathematics and Play in CAPS

Introduced in South Africa in 2012, CAPS replaced the previous curriculum framework known as the National Curriculum Statement (NCS) and was implemented across various grades and subjects. CAPS provides a framework for curriculum content, teaching, and assessment in South African schools. It outlines the knowledge, skills, and competencies that learners are expected to acquire at each grade level. However, concerning outlining how play is managed, CAPS falls short. Despite strongly advocating play, including in the forward of the policy statement – with a specific focus on the active role of the teacher as that of a mediator of play, as opposed to a facilitator – there is little mention of *how* this play is managed and promoted in Grade R:

The approach to learning Mathematics should be based on the principles of integration and play-based learning. The teacher should be proactive, a mediator rather than a facilitator. A mediator makes the most of incidental learning opportunities that arise spontaneously during a range of child-centred activities such as free play in the fantasy corner or block construction site, sand, and water play. (DBEa, 2011b, p. 14)

“Play” is mentioned throughout the CAPS document (65 times in all) in simple terms such as “free play”, “water play”, and “sand play”. The presence of this word in the document suggests the acknowledgement of the importance of play in learning and development; however, the extent to which it is valued and integrated into educational practice remains elusive. In contrast, the word “number” appears 1191 times, “learner” is used 1171 times and “teacher” appears 671 times

According to CAPS, the approach to learning mathematics in early childhood education should be based on integration and play-based learning. The teacher should take an active role as a mediator rather than just a facilitator, seizing spontaneous learning opportunities that arise during various child-centred activities. In CAPS, suggested activities range from free play to teacher-guided activities focused on counting, number concept development, patterns, and “other mathematical activities”; however, these are not particularly clear as to how these approaches are to be integrated for the teacher navigating CAPS. Additionally, CAPS suggests games and play that incorporate numeracy, such as measuring during cooking or counting during shopping (DBEa, 2011b). These oversights create a need to more clearly guide teachers how to achieve integration through play-based learning.

Concerning the acquisition of emergent mathematics, CAPS clearly states that this should follow three stages of learning: i) the kinaesthetic stage, ii) the concrete stage, and iii) the paper and pencil representation stage. There is a daily programme in the Grade R CAPS with teacher-guided activities, routines, and child-initiated activities or free play, all of which should promote the acquisition of emergent numeracy in a “fun” and spontaneous context. Routines such as snack time and arrival can also be given a mathematics focus. During free play, the teacher can structure the play area to promote emergent mathematics, such as using outdoor play equipment to teach mathematical vocabulary and sand and water play to teach concepts like mass and volume.

According to CAPS, the Grade R approach should encourage problem-solving, logical thinking, reasoning, cooperative learning, and negotiation. Assessment in Grade R should be informal and based on observation, with the teacher keeping records using a checklist. The policy emphasises that it is important to have a flexible and play-based approach to Grade R that aligns with the unique characteristics and developmental needs of young children, rather than trying to replicate a formal Grade 1 classroom.

CAPS promotes an informal assessment approach in Grade R, prioritising observation over formal testing. Teachers are advised to maintain records using checklists and to evaluate children’s progress through ongoing observation of their activities and interactions during play-based learning sessions. This method aligns with the developmental requirements of young learners and aims to offer a comprehensive insight into their learning and growth. CAPS stresses the significance of flexible assessment

practices, enabling teachers to tailor their approaches to accommodate the unique needs of each child and foster an inclusive learning atmosphere (DBEa, 2011b). However, it does not provide any outline of what these flexible approaches should look like and this is further complicated by the Grade R teachers needing to provide a score for each learner in accordance with the DBE's national protocols for assessment for Grades R to 12 (DBEb, 2011).

Finally, on 26 October 2023, the National Assembly passed the BELA Bill. This bill makes Grade R compulsory and also shifts the power of determining school language and admission policies from school governing bodies to provincial education heads. Additionally, parents who fail to enrol their children for Grade R could be formally penalised in terms of BELA 2023.

2.5 IMPLEMENTING GRADE R IN A DIVERSE SOCIETY

2.5.1 ECD, Grade R, and the Curriculum

In South Africa, the formalisation of Grade R has been a transformative process in the country's education system, marking the transition from early childhood education being a shared responsibility with the Department of Health and Social Welfare to becoming an integral part of the primary school system under the DBE. However, the practice of Grade R teaching is still complex in many ways; it is also still emerging and evolving, and therefore, requires a nuanced approach to understanding the associated issues about this grade (Atmore, 2013; Excell & Linington, 2020).

Grade R was introduced as part of the new education dispensation in South Africa following the end of apartheid. With the advent of democracy in 1994, the South African government recognised the critical importance of ECD in laying the foundation for lifelong learning and development. The first democratically appointed South African government began focusing on providing early childhood education and development opportunities for children, especially those of low socio-economic status. This was due to the understanding that children growing up in poverty and neglect are at higher risk for negative outcomes (Samuels et al., 2015). The new political dispensation aimed to redress past inequalities and improve the quality of education across all levels. Consequently, ECD including the Grade R year became a significant area of focus.

In the South African education context, White Papers refer to policy documents that provide guidelines and frameworks for various aspects of the education system. By 1995, White Paper 1 on Education and Training included the introduction of the term ECD and outlined the government's intention to introduce by 2010 one compulsory preschool year, called the reception year (Grade R). The 2001 White Paper 5 (focused on ECD) indicated that the most economical model to achieve the White Paper aim was to locate Grade R in existing primary schools and that consequently, 80% of Grade Rs were to be located at primary schools (DoE, 2001). By 2002, the revised National Curriculum included Grade R in the Foundation Phase.

With the support and funding of the Tirisano⁵ Programme, the DBE began in 2002 to establish Grade R classes to improve the school readiness of children entering Grade 1. It was thereby intended that learners would be provided with the necessary skills to transition into formal schooling (Chisholm, 2004). The rollout of Grade R was a phased process, starting with the establishment of Grade R classes in existing primary schools and gradually expanding to include community-based ECD centres. The aim was to ensure that all children had access to a standardised and high-quality Grade R programme, regardless of their socio-economic background.

One of the key challenges in the formalisation process was the training of Grade R teachers and the development of an appropriate curriculum. The government invested in teacher training programmes to equip teachers with the necessary skills and knowledge to deliver the Grade R curriculum effectively. Additionally, the NCS for the Foundation Phase was developed to provide a structured framework for Grade R education.

While access to Grade R has improved, challenges remain in ensuring the quality and equity of Grade R programmes across different regions and communities. Ongoing efforts are needed to address disparities in resources, teacher qualifications, and learning outcomes to ensure that all children benefit equally from Grade R education (Ashley-Cooper et al., 2019).

⁵ Tirisano was launched in 2000 for the period 2000-2004. 'Tirisano' (meaning 'working together') identified key objectives, activities, and outputs in the areas of health, schooling, and higher education. Chisholm, L. (2004). The quality of primary education in South Africa.

2.5.2 Diversity of Cultures

South Africa is a highly diverse country with regard to cultures, languages, and traditions. Grade R classrooms reflect this diversity, with learners coming from different cultural backgrounds (Linington et al., 2011). It is therefore essential for teachers to embrace and celebrate this diversity, incorporating diverse perspectives into teaching and learning thereby creating an inclusive learning environment. These sentiments are echoed by scholarly writings that motivate the need for improved models that support teachers in acquiring more developmentally sound didactic approaches, arguing for the need for participatory, democratic approaches to Grade R teaching.

Penn (1997) raised concerns that speak to the need for greater cultural sensitivity and relevance in early childhood programmes in sub-Saharan Africa. While it is assumed that all children (regardless of race) will have equal access to education, achieving equality of experience for children below school age is more challenging. Besides resource limitations and cultural differences, the current Western models of early childhood education may not be suitable or beneficial for indigenous African cultures and may even be seen as a form of cultural intimidation. Penn (1997) also discusses the role of NGOs, unions, employers, and the government in ECD whereby Western norms are imposed that conflict with local traditions and values. This discussion highlights the disparities between white and black children in terms of equitably accommodating all cultures. Penn also points to the efforts being made to address these issues. Some studies have explored the cultural perspectives on childrearing in sub-Saharan Africa, highlighting significant differences from Western standards, suggesting the need for reconciling different traditions and understanding the unique context of South Africa.

Similarly, Gamble (2003) argues that in a country like South Africa, with a history of systemic discrimination, the curriculum must not only address cultural challenges but also embrace classroom diversity. Recognizing this enables teachers to leverage the varied social and cultural resources present in the classroom to enrich the learning experience.

Linington et al., (2011) describe the need for didactic orientation, where greater focus needs to be placed on how and what teachers question in class discussions and making room for conversations about topics that “matter” to children (Linington et al., 2011, p. 42). Arising from an initiative to develop stronger partnerships between Grade R teachers and higher education institutes, Rutgers and Reddy (2013a) explore the dialectical

relationship of collaboration to assist teachers with professional development and development of cognitive capacity in pre-service teachers. Although the focus of the Rutgers and Reddy study was on leadership skills, it provides insight into supporting continuous growth and development, personal accountability, critical analysis, and reflection. These aspects, in turn, mould teachers into teachers who can respond and adapt to their learners' needs and ensure that every child is seen and heard.

The South African Constitution, adopted in 1996, is widely regarded as one of the most progressive constitutions globally, and it explicitly addresses the importance of diversity in several ways. Diversity in early childhood education supports the principles of inclusive education. All children, regardless of their background, benefit from an inclusive environment that values and respects individual differences. Section 28 of the Constitution protects the rights of children, emphasising the best interests of the child as a paramount concern. It recognises and respects the child's cultural, linguistic, religious, and community identity

Section 6 of The South African Constitution of 1996 recognises the diversity of languages in South Africa. It states that everyone has the right to use the language and the cultural life of their choice, This provision acknowledges the unique linguistic diversity in South Africa and emphasises the importance of preserving and promoting various languages. Furthermore, the Constitution highlights the importance of respecting and nurturing the diverse identities of children in a South African context. Inclusive education sets the foundation for a society that embraces diversity and promotes equal opportunities for all.

2.5.3 Diversity in Language

South Africa has 11 official languages, reflecting its unique linguistic diversity. In Grade R classrooms, a large percentage of the learners have a different first language (home language) to the language of instruction in the classroom. According to curriculum policy, teachers should be sensitive to language differences and provide support for learners to develop proficiency in the language of instruction, usually English, while acknowledging and valuing their home languages (DBEa, 2011b).

In presenting their research findings and clinical experiences, Von Esch et al. (2020) explore the linguistic, cognitive, and academic challenges faced by internationally adopted children who have experienced life in institutionalised settings. The authors

stress the necessity for the international educational community to deepen its comprehension of how language instruction and learners' experiences are impacted by historical practices such as colonial expansion, including settler colonialism and transatlantic slavery. They outline the origins of research on race and language teaching and their survey of the literature shows a recent broadening of studies examining the complexities of race and racism in language education. Von Esch et al. propose potential remedies for addressing the consequences of racial disparities.

In a similar study, Gindis (2005) describes how they used the theoretical framework of Vygotsky to understand the psycho-educational and remedial aspects of cultural challenges confronted by international adoptees. Attention to mother-tongue attrition from the acquisition of English revealed tensions culminating in cumulative cognitive deficits due to the absence of cultural mediation in early childhood and a profound loss of their mother tongue.

Many of the insights and implications discussed in the study apply to migrant workers' children as well. Like internationally adopted children, migrant workers' children often face similar challenges related to cultural adaptation, language acquisition, and educational attainment in a new environment. Gindis (2005) recommends professionals working with internationally adopted children, including psychologists, social workers, and therapists, can benefit from a more nuanced understanding of the cultural challenges faced by these children. Consequently, they need to adapt their interventions and therapeutic approaches to be culturally sensitive and address issues such as native language attrition and cultural identity development. Insights from the article can inform policymakers and practitioners in the fields of adoption and child welfare about the specific needs of internationally adopted children. This can lead to the development of policies and practices that prioritise the well-being and successful integration of these children into their new families and communities. The Gindis study highlights the need for further research into the cognitive and socio-emotional development of internationally adopted children, as well as the effectiveness of remedial interventions.

The Roberts et al. (2022) study recognises the potential of storybooks and storytelling to enhance young learners' mathematical abilities while also reducing mathematics anxiety. They suggest that exposure to mathematics instruction through children's literature can improve children's achievement, mathematical discourse, motivation, and teachers'

practices. In particular, their study demonstrates how picture books have been shown to engage children cognitively, capturing their interest in numbers and mathematical concepts. However, their research also indicates that children's attention to numbers often occurs when directed by teachers, rather than spontaneously.

Additionally, the Roberts et al. (2022) study provided evidence that indicated that interactive read-aloud curricula could improve learners' understanding of shapes, quantities, and spatial relationships. Their findings demonstrated that storytelling is a cognitive strategy for mathematical sense-making, with narrative serving as a vehicle for understanding. Moreover, they argue that this approach fosters emotional connection, which influences cognitive processes and supports mathematical sense-making.

Jorgensen and Graven (2022) assert that numeracy represents an applied facet of literacy, and although literacy and numeracy exhibit distinct characteristics (especially in the early years), the teaching of numeracy remains intertwined with literacy. This is of importance in multilingual classrooms characterised by cultural diversity, where barriers to learning can arise. Jorgensen and Graven argue that the process of teaching numeracy and literacy, and the fostering of mathematical understanding form part of a complex process. This relies on dialogue between learners and various stakeholders, including teachers, peers, and self. Jorgensen and Graven describe how the complexity intensifies when learners enrol in schools where multiple languages are spoken, and the language of instruction differs from their native tongue; for example, they explain how in a lesson explaining the notion that two halves constitute a whole, linguistic nuances like homophones ("whole" and "hole") may lead to misconceptions.

In a similar vein, Purpura et al. (2019) show how early mathematical language skills play a central role in young children's development of early mathematics skills arguing that being able to grasp mathematical concepts and articulate them are essential aspects of learning mathematics. The progression of language skills among young learners plays a pivotal role in their comprehension of mathematics. Purpura et al. describe the importance of moving from the spontaneous language used in everyday play by young learners to the more formal language required in mathematics. They suggest that, with time, both mathematical concepts and language become more refined through engaging with language, particularly in playful contexts, supporting early learners in acquiring numeracy skills.

2.5.4 Diversity of Socio-Economic Backgrounds

Poverty and inequality have detrimental effects on numerous individuals residing in both urban and rural areas throughout South Africa (Ashley-Cooper & Atmore, 2013; Hoadley, 2017; Maistry & Africa, 2020). These challenges have a particularly profound impact on children and their families in these impoverished communities, as they are deprived of their socio-economic rights. These children furthermore face inadequate access to essential services and needs such as healthcare, education, social services, and nutrition. Ashley-Cooper and Atmore (2013) detail how deprivation not only makes childhood a period of hardship but also hinders the healthy development of the child, thereby manifesting as the primary barrier to the fulfilment of children's rights.

Caro et al. (2009) describe the connection between family socio-economic status (SES) and academic performance as a socio-economic gradient, characterised by a gradual increase across varying SES levels. Their study indicated a disparity in academic achievement between learners from high and low SES backgrounds, demonstrating that this socio-economic gap during the early schooling years carries long-term implications. Specifically, as children from low SES backgrounds progress in age, their circumstances often deteriorate. Owing to their comparatively limited skills, they are more likely to drop out of school prematurely. Their findings suggest that school practices exhibit biases in how they treat learners based on their respective socio-economic backgrounds, thereby mediating the influence of SES on academic achievement. For instance, the biased allocation of learners into groups during schooling may result in divergent educational outcomes among SES groups, such as consistently placing low-SES children in lower-ability groups and high-SES children in higher-ability groups. Even within systems that do not segregate learners into different schools, practices like ability grouping within classes.

However, Caro et al. (2009) suggest that while ability grouping should not be entirely abandoned, it should be redefined in light of research on how various grouping methods impact the academic gap between higher and lower SES learners. Understanding the ramifications of such practices on classroom dynamics, such as teacher pacing, learner participation, and class discussions, is essential. Based on this understanding, teachers should advocate for grouping practices that mitigate the gap, without compromising the benefits of higher-ability groups. This implies that stakeholders in education (including

teachers, principals, and policymakers) should possess knowledge about the effects of grouping practices and base decisions on this evidence to potentially enhance the efficacy of grouping strategies.

Robinson and Zinn (2007) revealed in their study how socio-economic factors contribute to diversity in classrooms, describing how learners may come from different socio-economic backgrounds, influencing their access to resources and support outside of school. They suggest that teachers should be aware of these differences and implement strategies to address potential inequalities, ensuring that all learners have equal opportunities for learning and development.

Accordingly, Robinson and Zinn (2007) argue that the landscape of teaching in South Africa is such that it requires social and pedagogic responsibilities and that teachers need to be willing and equipped to educate learners in a manner that actively values human dignity, equality, and freedom. Moreover, they argue that teachers are key figures in shaping values in schools and as such, require diversity training as part and parcel of training both pre-service and on an ongoing basis once qualified (Robinson & Zinn, 2007).

Cochran-Smith (2004) argues that teachers should possess a nuanced understanding of how larger-scale issues such as political and economic instability affect the local context and, consequently, influence the effectiveness of classroom teaching strategies. In other words, teachers should recognise the interconnectedness between broader societal factors and the specific teaching methods they employ in their classrooms. They stress that by acknowledging this link, teachers can develop strategies to tailor their classroom activities to address the challenges arising from these macro issues. This approach requires teachers to be responsive to the unique needs and circumstances of their learners, considering how external factors may impact their learning experiences.

Investing in education has long been acknowledged as a primary means of addressing poverty and inequality. Ashley-Cooper and Atmore (2013) describe recent studies that indicate that targeted investment in ECD teacher training programmes yields significant returns, surpassing those of most other investments into educational programmes. Such investment not only contributes to the education of beneficiaries but also supports the training and sustenance of the ECD workforce. This is done while providing children with

quality ECD stimulation and programming. The study describes how economic investment into ECD serves as a foundation for reducing poverty and inequality, benefitting the broader economy as well.

2.6 PLAY, MATHEMATICS, DIVERSITY, AND GLOBAL PERSPECTIVES

This final section brings together the thread linking the aforementioned topics in this review. The intersection of play, emergent mathematics, and diverse classrooms represents a multifaceted and dynamic landscape within early childhood education. The literature described how play, often regarded as the primary mode of learning in young children, serves as a natural context for the exploration and development of mathematical concepts. Through play-based activities, children engage in hands-on experiences that promote mathematical thinking, problem-solving skills, and mathematical language development.

2.6.1 Merging the Literature

Within diverse classrooms that encompass a range of cultural backgrounds, languages, abilities, and learning styles, the integration of play and emergent mathematics becomes even more crucial. Recognising and embracing diversity enriches the learning environment, fostering opportunities for cross-cultural exchange, collaboration, and the celebration of individual strengths and perspectives. Play-based pedagogy provides a flexible and inclusive approach that allows children from diverse backgrounds to actively participate and engage in meaningful learning experiences.

Furthermore, the literature describes emergent mathematics that emphasises the importance of recognising and building upon children's spontaneous mathematical discoveries and interests. By scaffolding these emergent mathematical behaviours and enquiries, teachers can guide children towards deeper mathematical understanding while honouring their pathways of learning. This approach becomes particularly relevant in the South African context as teachers navigate varied cultural perspectives on mathematics, and tailor instruction to meet the diverse needs of their learners.

There is a need for deeper study into the pedagogy of play in early childhood education. Importantly, Björklund et al. (2020) caution against underestimating the particular circumstances involved in researching emergent mathematics. They highlight how

common it is for children to act differently during research and that researchers need to take this into account in their research design, ensuring multiple modes of research over extensive periods. In this section, the discussion reports on the meeting of play and mathematics in diverse settings, emphasising strengths and areas still needing further investigation.

2.6.2 International Research

Unlike in South Africa, Norwegian schools are not required to follow a prescribed curriculum and consequently, teachers can make autonomous decisions as to how to structure their daily programmes. Having said that, play remains central to the key guidelines as outlined by the Norwegian Ministry of Education and the framework also indicates that teachers should support and enhance it (Norwegian Ministry of Education, 2005). A study of two Norwegian kindergartens involved an interpretative study with a vision of investigating the manner of support provided by teachers during free play activities (Karlsen & Lekhal, 2019). The conclusions arrived at by the researchers indicated that, despite the small teacher-to-pupil ratios, the support provided by teachers was limited and there was minimal evidence of co-construction, assistance, and teaching. They observed low-quality interactions, with practitioners often not joining in play or providing meaningful support. The findings suggest the need for more intentional and supportive interactions during free play in kindergartens. The study concludes that although Norwegian kindergartens provide a significant amount of time for free play, there is insufficient support from practitioners during this time. This is concerning, especially for vulnerable children who may not receive optimal stimulation at home. The study suggests that high-quality kindergartens have the potential to reduce achievement gaps before formal schooling and that there is untapped potential in Norwegian kindergartens and a need for closer examination of how children's learning is supported. Similarly, drawing on the writings of Bakhtin and Vygotsky, Stetsenko and Ho (2015b) describe how, through social interaction (specifically play), children can be provided with opportunities to exercise agentic behaviour. This culminates in forming a strong identity and sense of belonging. Stetsenko and Ho explore the transformative activist stance (TAS) which evolved from the works of both Bakhtinian and Vygotskian traditions and suggest that TAS fulfils the function of allowing a child to experience individuality while still maintaining a sense of community. Stetsenko and Ho (2015a) also discuss play as a

process of creative transformation and co-authorship of the self and the world. They describe how the role of language and discourse through the medium of play can influence the process of human development, linking strongly with Vygotsky's principle of general genetic law which encapsulates the process of internalisation. The most salient point they make is that, despite all the interest and research into the value of play, its true "richness" and value are hard to note and quantify.

That being said, through the insertion of interactions of free play encounters between two four-year-olds, the study provides a powerful illustration of how young children create, negotiate, and recreate play worlds with both individual and shared interests. Moreover, although the four-year-olds shared the same goal – that being to co-author pretend play, there were significant power relation dynamics being exercised, emphasising the need for early education to prioritise play to support children's development.

Papandreou and Tsiouli (2022) discuss the importance of recognising and understanding children's everyday mathematics during play in early childhood classrooms, emphasising the need for teachers to value and notice the mathematical resources that children bring to school. The study in a diverse Early Childhood Education class in Greece investigated the content, processes, and origin of children's mathematical knowledge. It also explored how this knowledge is situated and revealed during play activities, including understanding of number and operations, measurement, space, geometry, and emergent algebraic thinking. The researchers recommended a responsive curriculum that incorporates children's everyday mathematics and promotes the role of play in investigating and documenting children's mathematical knowledge. The study also identified different types of activities that foster mathematical thinking, including block play, graphic activities, sociodramatic play, and peer discussions. The researchers emphasise the importance of observation during play interactions for understanding children's cultural ways of knowing.

Kay (2023) explored the conflicts that emerged between the professional beliefs and knowledge of reception teachers and the school readiness agenda in England. The study investigated how growing academic pressures on children to be "school ready" clash with teachers' views on early childhood learning, their teaching methods, and classroom approaches. Of importance, the study employed CHAT as both a methodological approach and an analytical tool. The findings depict the reception classroom in this

particular study as a complex activity system influenced by internal and external factors, significantly impacting teachers and their teaching methods. Regardless of a child's initial proficiency upon entering reception, there was an expectation for all to achieve the 17 Early Learning Goals by year-end, placing considerable pressure on teachers. The time constraints for meeting these goals prompt a shift towards more formal teaching methods, sacrificing play-based learning. Additionally, Year 1 expectations that filter down to Reception further intensify this trend towards formalised instruction that is endorsed by education officials.

Additionally, the findings by Kay describe internal pressures from whole-school policies, such as “cursive writing” and “early editing”, exacerbate the situation, despite resistance from teachers which create dilemmas for teachers torn between the importance of play for young children's holistic development and the pressure to meet academic benchmarks. The study identified the need for further research to explore how these tensions and contradictions can serve as initial points for fostering transformative teacher agency and organisational change within the collective activities of the classroom.

Van Oers (2015) suggests that owing to the growing perception of schools as a vital economic component, the curriculum has increasingly evolved into a rigid structure with predetermined objectives, leading to conflicting motivations for teachers who also aim to cater to the interests and understanding of their learners. Drawing on insights from Dutch experiences with the Developmental Education curriculum, the Van Oers study revealed that this dilemma could be addressed by introducing a play-oriented curriculum as a formative intervention. Van Oers insisted that this approach fosters flexibility for both teachers and learners, allowing them to interpret binding cultural elements in ways that resonate with their learning experiences. Using the CHAT model as a unit of analysis, the challenges encountered by teachers were viewed and presented through the lens of ongoing “double stimulation”, meaning the simultaneous impact of both external environmental factors and internal individual motivations on learning and development. Van Oers (2015) demonstrated that individuals are influenced by the surrounding social context such as cultural norms, institutional structures, and social interactions, while also being driven by their internal desires, goals, and cognitive processes. Double stimulation emphasises the dynamic interplay between external constraints and internal motivations in shaping how individuals engage with their environment, learn, and develop over time.

Van Oers contended that empowering teachers within a play-based curriculum involves equipping them with suitable tools – both tangible and conceptual – to navigate teaching hurdles while adhering to the cultural and political parameters of the play-oriented curriculum.

The intersection of play, emergent mathematics, and diverse classrooms emphasises the importance of creating a dynamic and inclusive learning environment where learners can naturally discover and develop mathematical understanding through play-based activities that are culturally relevant and responsive to diverse needs.

Research in the field of early childhood education highlights the importance of understanding the pedagogy of play and the need for more intentional and supportive interactions. Additionally, play can provide opportunities for children to exercise agency and form strong identities and belonging; importantly, the mediating role of language and discourse in emergent mathematics is crucial, notwithstanding the ever-present pressure and difficulty of quantifying the value of play. Observation during play interactions is seen as crucial for understanding children's ways of knowing and should form the basis of assessment of learning – hence highlighting the need to prioritise play and understand children as individuals and social beings in early education.

2.7 CONCLUSION

The literature review covered the importance of play in early childhood education, emergent mathematics in Grade R classrooms in South Africa, and the intersection of these topics. The sources mentioned covered a wide range of topics related to ECD in South Africa, including curriculum reform, assessment, play, emergent mathematics teaching, and the impact of early childhood education on later academic achievement.

In covering these topics, unanswered questions remain regarding how play is supposed to lead learning. According to global consensus, play is supposed to direct learning and be the driving force of activity in early childhood education, yet there are still indications of the separation of play and learning occurring. Moreover, there is obscurity regarding what role teachers play in adult-led play for learners and the effects that this has on learning. The literature suggests that teachers in early childhood education need to be better prepared on how to work in collaboration with mentorship programmes in order to

become more capacitated to promote play in a more linguistically and culturally diverse way.

The literature on play and early childhood education highlights several gaps that need to be addressed for a more comprehensive understanding and effective implementation of play-based learning. While different types of play – free play, child-led play, and adult-led play – have been studied for their impacts on executive function development, there is a lack of research on how these play types interact over time and influence broader aspects of child development, such as social skills and emotional regulation.

Despite extensive research on the factors influencing emergent mathematical thinking and the widespread empirical support for the importance of a sound number concept in mathematics, several gaps remain. While several studies highlight that numeracy is influenced by age, language, and social contexts, thereby challenging the notion that mathematical thinking is innate, there is a need for further exploration of how these factors interact and influence each other in different educational settings. The work of Siemon (2003) emphasises the practical application of numeracy **beyond the classroom, involving confidence and fluency in mathematical skills that enable critical thinking and decision-making**. However, there is a gap in understanding how these skills can be effectively nurtured in diverse and real-life contexts.

Research also underscores the importance of both free and guided play in children's mathematical learning, with a significant emphasis on the role of teachers in creating and guiding learning opportunities during play. This suggests a need for more detailed investigations into the specific actions and strategies that teachers can use to facilitate deeper mathematical thinking and engagement during play-based activities. The current discourse advocates a balance between free and guided play, yet there is a dearth of clear guidelines and best practices for teachers on how to effectively implement guided free play in various educational contexts.

Additionally, Coles and Sinclair's (2019) concept of ritualisation in the mathematics classroom, which involves structured repetition and symbolically meaningful activities, calls for a reconceptualisation of classroom rituals to support mathematical learning. However, there is a gap in practical research that demonstrates how ritualisation can be effectively integrated into everyday teaching practices without reducing it to thoughtless

or mechanical actions. More empirical studies are needed to explore how ritualisation can enhance mathematical learning and engagement, particularly in diverse classroom settings. Overall, these gaps highlight the need for a more nuanced understanding of the interplay between teaching strategies, play-based learning, and the development of mathematical thinking in early childhood education.

The role of cultural and social dynamics in shaping the nature and benefits of play is acknowledged, but more studies are needed to explore these influences in specific cultural contexts. Additionally, there is a need for detailed case studies and longitudinal research on professional development programmes that can effectively transform teacher practices, particularly in diverse and marginalised communities.

Although ongoing teacher development to support marginalised learners is emphasised, specific strategies for integrating play-based learning in these contexts are underexplored. The mechanisms through which different types of play impact executive functions are not fully understood, necessitating further investigation into the conditions under which free play might contribute to these functions. The literature often focuses on isolated aspects of development, so research adopting a holistic approach to examine cognitive, social, emotional, and physical development through play would be beneficial.

Furthermore, while discourse analysis is recommended for engaging teachers in transformative practices, its application in current research is limited. Comparative studies examining the developmental impacts of play across different global contexts are also needed to highlight universal principles and context-specific adaptations. Addressing these gaps can lead to a more integrated understanding of play's role in early childhood education and inform more effective practices and policies.

The review also emphasised the need for teacher training and support in implementing play-based learning and promoting emergent mathematics. It discussed the challenges and benefits of incorporating play in the classroom and the importance of considering the diverse needs of learners. The review highlighted the limitations of current policy and curriculum frameworks and called for further research in these areas. These limitations relate to Grade R being moved into formal education, and consequently assuming a more regimented approach. There is also a lack of consensus around the term of number sense and studies show that children have an innate number sense that, to a large extent, is still

underutilised. Games and number line work need to be used more regularly as the benefits of early and continued use of both are well documented. Here again, the role of the teacher needs to be more clearly articulated. Additionally, the chapter discusses the importance of language and executive functions in children's mathematical abilities and the need for teachers to adapt the curriculum to suit their contexts. The impact of lack of mother-tongue instruction cannot be underestimated and hand-in-hand, there needs to be a greater focus on collaboration through on-site support and practical demonstrations for teachers.

Of interest, there is a need to revisit the conceptualisation of rituals as a practice that demystifies the notion of rote-based learning. The review suggests that teacher education programmes should prioritise play and provide ongoing professional development to enhance cultural competence and effective teaching. The implications for future research include studying the pedagogy of play and observing children's ways of knowing during play interactions.

The following chapter explores the theoretical framework that underpins this study, focusing specifically on CHAT. This chapter will explore the core concepts of CHAT, its historical roots, and its application in educational research, laying the foundation for a deeper understanding of the dynamics at play within the early childhood education landscape.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1 INTRODUCTION

The previous chapter covered literature on the topic of play and emergent mathematics in diverse classrooms. This chapter details the theoretical framework guiding this study. CHAT encapsulates a theoretical framework rooted in the principles and concepts of Vygotsky's sociocultural theory, Marxist philosophy, and the exploration of how human activities are shaped by cultural and historical contexts (Vasileva & Balyasnikova, 2019). This chapter provides a detailed account of this framework and comprises two parts. In the first part of the chapter, the key elements that form the theoretical framework are discussed, commencing with broad, overarching principles related to the seminal works of Vygotsky. In the second part, the subsequent generations of Vygotskian tradition (culminating in CHAT) are detailed with the underpinning of the first part of the chapter providing the grounding for the theoretical expanse of this study.

In the first section, the core elements in Vygotsky's developmental framework are examined; the framework includes the process of internalisation, the general genetic law with emphasis on the role of internalisation in cognition, and the significance of language and speech as mediating factors in learning. The discussion then moves to the role of mediation with an explanation of the concept of mediation and its significance in facilitating learning with insight into how various forms of support (such as teachers and tools) mediate the internalisation of knowledge. This leads to an elaboration on the ZPD and how this represents the "teachable space" and contributes to the scaffolding of learning. Finally, the implications of Vygotsky's theories on education and development are explored, and these then serve as a transition into the second part of the chapter that focuses on CHAT.

The second part of the chapter traces the development of the theory of CHAT through successive generations of researchers who have continued the work of Vygotsky. Thereafter, the discussion focuses on the core concepts associated with CHAT, including the object of activity, the role of dialectics in promoting discursive manifestations to uncover contradictions, the emergence of the germ cell, the role of historicity and

artefacts, and then finally, the emergence of expansive learning and the potential for this to be applied to enhance educational outcomes.

3.2 VYGOTSKY'S SEMINAL WORKS

Vygotsky's contributions to the fields of developmental psychology and education during the early to mid-20th century (including *Thought and Language* in 1965 and *Mind in Society* in 1978) have had a lasting impact on understanding cognitive development and learning processes (Vygotskiĭ, 1997). Vygotsky's ideas have influenced educational practices worldwide, promoting collaborative and socially mediated approaches to learning that recognise the vital role of social and cultural factors in shaping the mind (Bodrova & Leong, 2019; Vasileva & Balyasnikova, 2019).

In this section are the key concepts of Vygotsky's theory, which form the foundation of CHAT. These concepts are interconnected, offering valuable insights into the intricate and multifaceted nature of this theory.

3.2.1 General Genetic Law of Cultural Development

This law is Vygotsky's work on the mediating role that speech plays in development and learning. He used this model to provide an effective description of the intricate process of internalisation, namely that through social interaction (intermental processes), a child can internalise activity. This practice is commonly recognised in children who display external speech as a physical manifestation of their thought processes. He describes this as a prerequisite to internalization. Often, when this happens, egocentric speech occurs, where the child talks or whispers to herself

Vygotsky argued that in such a manner, the child is undergoing psychological transformation and is thus able to make sense of her world (Vygotsky & Cole, 1978). Hence, play is central in supporting this process as through interaction within a social context, the child can co-construct meaning, and learning is mediated through interpersonal relations.

Vygotsky, and subsequently contemporary researchers in the field, describe the interconnectedness of creativity and imagination to children's real-life experiences in their culture and society, and, more specifically, they explain how these manifest through play activity (Hedegaard, 2016; Vygotsky, 2004). Vygotsky (1978) argued that these

shifts are vital stages and are closely associated with internalisation and personality development. These require language, signs, and symbols to fully support the process which can include language, notations, and cultural symbols. Language, as a system of signs evolves from social interactions and is gradually internalised by individuals, becoming a tool for thinking. The use of signs and symbols enables individuals to mentally represent and manipulate abstract concepts, extending their cognitive abilities (Vygotsky, 1962).

General genetic law underscores the crucial role of social interaction and language in cognitive development, implying that children internalise knowledge through social interactions and verbal communication. This law highlights that external and egocentric speech are essential steps in transforming social experiences into internal thought processes, making verbalisation a key component of learning. Play is central to this process, as it enables children to co-construct meaning and internalise new concepts within a social context. Additionally, general genetic law emphasises the interconnectedness of creativity, imagination, and cultural experiences, suggesting that learning activities should be culturally responsive and integrate various symbolic tools to enhance cognitive abilities. This perspective advocates for educational environments that foster social interaction, encourage verbalisation, and utilise cultural symbols to support development.

3.2.2 Mediation

Mediation is a term closely intertwined with the internalisation processes discussed in the general genetic law and represents integral support to the process of internalisation. It encompasses support mechanisms facilitating the absorption and processing of knowledge, incorporating the influences of teaching, language, tools, artefacts, and materials (Vygotsky & Cole, 1978). Closely associated with CHAT, mediation as a process is situated within this activity system. It has the potential to reshape perspectives, particularly in educational situations requiring a teacher or MKO (Cole & Engeström, 1993).

The concept of scaffolding, rooted in mediation, has significant implications for education by promoting individualised and progressive learning in the ZPD (expanded on later). Scaffolding requires teachers to assess each child's current competence and

provide tailored support, which is gradually removed as the child gains proficiency. This approach fosters independence, self-confidence, and deeper understanding by encouraging learners to tackle increasingly complex tasks. Mediation ensures engagement by maintaining an optimal level of challenge, preventing frustration or boredom, and enhancing teacher-student interactions through dynamic feedback and support. It also supports collaborative learning, allowing knowledgeable peers to assist others, and fosters metacognitive skills by helping learners become aware of their own learning processes. Additionally, mediation demands culturally responsive teaching and flexible instructional methods, ensuring that support is relevant and effective for diverse student populations, ultimately creating a more responsive, engaging, and adaptive educational environment.

According to Hedegaard (1996), this role has undergone a “shift”, challenging the traditional notion of a unidirectional teaching process. Instead, it highlights how communities engage in reciprocal learning through shared practices. Central to this concept is the role that artefacts, particularly tools, play in mediating the acquisition of knowledge, underscoring the culturally and socially embedded nature of learning, as reaffirmed by Hedegaard (1996). Stemming from this understanding, it requires teachers to understand the profound influence practices and tools for teaching and learning have on supporting the planning and selection of activities that resonate with the learners’ sociocultural contexts.

The role of language in these shared practices is therefore essential and connects the learner with meaning-making when engaged with the activity. In addition to looking at the role of language in play, Vygotsky emphasised that it is not the act of play itself, but rather the meaning behind the play that is central to development and learning (Vygotsky, 1962). He described how the child, when engaged in the practice of play, is unaware either of the process of meaning-making occurring, or of the development of autonomy. The child, through play, is able to transform situations and in doing so, develop greater autonomy. Vygotsky was also clear regarding the transformative role that adults play in potentially directing a child’s play, thereby influencing their potential to be creative. As commented by Vygotsky and Cole:

Just as a mould gives shape to substance, words can shape an activity into a structure. However, the structure may be changed or reshaped when the children

learn to use the language in ways that allow them to go beyond previous experiences when planning future action. (Vygotsky & Cole, 1987, p.28)

The statement by Vygotsky and Cole draws an analogy between a mould shaping a substance and words shaping an activity. It suggests that language can structure activities, much like a mould can structure material. However, as children learn to use language in innovative ways, their ability to go beyond prior experiences may reshape or alter the structure of activities, influencing how they plan and carry out future actions. In essence, as children expand their linguistic capabilities, their acquisition of language can lead to the evolution and adaptation of activities (Vygotsky & Cole, 1978).

Vygotsky's core belief revolves around the idea that our actions towards the world are never immediate; they always involve mediation through signs, symbols, or material instruments, and they occur within social contexts. Tools encapsulate humanity's history of interaction with the environment. Consequently, the utilisation of tools embodies the collective wisdom of communities. Hence, it is impossible to wield a tool effectively without comprehending the surrounding community or culture. Vygotsky emphasised language as the central tool, highlighting its pivotal role in mediating human interaction, cognition, and cultural transmission (Fleer, 2020).

Language is a primary tool of mediation in Vygotsky's framework, serving as a bridge between social interaction and internal thought. Through language, children learn to articulate their thoughts, negotiate meaning, and internalise complex concepts. This emphasises the necessity of creating rich linguistic environments in educational settings, where children can engage in meaningful dialogue and verbalise their thinking. The use of cultural tools – such as language, signs, and symbols – further enhances cognitive development by providing mental representations that extend children's cognitive abilities. Educational practices should therefore integrate these tools, making learning relevant by connecting it to the learners' respective cultural backgrounds. Collaborative learning approaches are also supported by the concept of mediation, as they encourage learners to work together, solve problems, and build knowledge collectively, fostering a sense of community and peer interaction.

Play is another crucial element in Vygotsky's theory of mediation. It is viewed as a mediated activity that significantly contributes to cognitive and psychological

development. Through play, children engage in social interactions that help them explore, experiment, and internalise new concepts within a meaningful context. This implies that play-based learning should be an integral part of early childhood education, providing a dynamic environment for cognitive and social growth. Vygotsky's emphasis on the interconnectedness of creativity, imagination, and cultural experiences further suggests that educational practices should be culturally responsive, integrating culturally relevant materials and examples to enhance learning (Kozulin, 2018). Overall, mediation in Vygotsky's sociocultural theory advocates educational environments that are interactive, collaborative, and culturally informed, supporting the interconnected processes of social interaction, language use, and cognitive development.

3.2.3 Internalisation

Associated closely with Vygotsky's general genetic law is the concept of internalisation, a process outlined explicitly in his seminal papers. According to Vygotsky and Cole (1978), genuine learning in a child occurs when the environment is structured to stimulate the child's cognitive functioning. Vygotsky's model of the general genetic law delineates the stages of internalisation, first through interaction (intermental understanding) and subsequently becoming internalised (intramental understanding). This framework aligns with the nature of Grade R classes, emphasising hands-on activities supported by language-rich experiences.

From Vygotsky's perspective, the process of change is closely tied to the concept of transformation, manifested in what he termed "critical periods". During these periods, a child undergoes psychological accommodations in response to life events or "crisis periods", leading to an enhanced understanding of societal demands and structures (Vygotskiĭ, 1997). Furthermore, Vygotsky asserted that play is crucial in shaping a child's relationship with society (Rieber & Wollock, 1997; Vygotsky & Cole, 1978). Gallimore (1992), citing Elkonin (1978), a student of Vygotsky, supports this idea, suggesting that play enables children to consider situations from different perspectives, laying the foundation for symbolic thought and intentional action. This perspective aligns with Vygotsky's view that play serves as the gateway to metacognition in young children (Vygotsky & Kozulin, 1986).

By implication, Vygotsky emphasised that authentic learning in children occurs when their environment is structured to stimulate cognitive functioning and that through play, a child can develop a deeper understanding of societal demands and structures. This is necessary for development, particularly during critical periods during which children undergo psychological adjustments in response to life events or crises.

Vygotsky's theory of internalisation is a central concept in his sociocultural theory, explaining how external social interactions and cultural tools transform into internal cognitive processes. According to Vygotsky, learning begins at the social level through interactions with others and then is internalised by the individual.

Language plays a crucial role in this process, serving as the primary tool for mediating social experiences and facilitating internalisation. Initially, children use language externally to communicate with others, but gradually, they begin to use it internally to organise their thoughts and direct their own actions. This shift from external to internal speech is a key aspect of internalisation, illustrating how social experiences are transformed into individual cognitive processes.

Through internalisation, children learn to use cultural tools (such as language, symbols, and signs) that are embedded in their social and cultural contexts. These tools enable them to represent and manipulate abstract concepts, enhancing their cognitive abilities. Importantly, and linked to this study, Vygotsky's theory stresses that cognitive development is not just an individual achievement but a socially mediated process, where cultural and social interactions are essential for the development of higher mental functions.

3.2.4 The Zone of Proximal Development

Vygotsky's pivotal concept, the ZPD, highlights the importance of the gap between what a learner can do independently and what they can achieve with guidance or support. He argued that social interactions and cultural contexts play a crucial role in shaping cognitive development, emphasising the significance of language and social interaction as tools that scaffold a child's mental abilities (Daniels, 1996)

The ZPD is a well-known concept in educational psychology, particularly from a pedagogical perspective. It plays a crucial role in delineating the teachable space that facilitates internalisation. Within this space, the educator/MKO assumes a pivotal role.

Vygotsky argued that intentional instruction, aimed at guiding the child at an appropriate level within the ZPD, enables the child to attain a higher level of psychological understanding not achievable without intervention. He emphasised the importance of the ZPD being slightly ahead of a child's current developmental stage yet still within reach, facilitating the child's ascent to a metalevel of understanding (Leong, 2023).

Speech and the teacher's role in mediating these processes remain central to achieving growth within the ZPD. This theoretical concept holds significance for the current study, both analytically and in its application. Play, mediated within the ZPD, provides opportunities for the child to progress through a diverse range of activities, supporting the transition stage (Hedegaard, 2016). The ZPD is where concepts associated with cultural-historical activity theories become prominent, as the child orients themselves. With the guidance of the teacher and supportive tools, the child integrates scientific knowledge with everyday knowledge, becoming meaningfully situated in the learning process (Vygotsky, 1978).

Scaffolding in the ZPD refers to the temporary support or guidance provided by an MKO such as a teacher or a peer, to help a learner accomplish a task that they could not do independently. This support is tailored to the learner's current level of understanding and skill, as well as their growth potential. Scaffolding is crucial for facilitating learning and cognitive development (Van Der Stuyf, 2002). The scaffolded support is gradually adjusted or removed as the learner gains proficiency and moves towards independent mastery of the task. Scaffolding can take various forms, including providing hints, asking leading questions, offering examples, breaking down complex tasks into smaller steps, modelling problem-solving strategies, and offering feedback (Vandenbroeck, 2017). Vygotsky emphasised that this social interaction plays a critical role in the development of cognition, as it provides opportunities for scaffolding – temporary support that is gradually removed as the learner becomes more proficient. This implies that teaching should be oriented towards the upper edge of a learner's capabilities, where they can achieve new skills and knowledge with appropriate assistance.

The ZPD represents the difference between what a learner can do independently and what they can do with guidance and encouragement from a skilled partner. This zone is not a fixed space but a dynamic region where learning is most effective. It encompasses the skills and tasks that a learner is on the verge of mastering but can accomplish only with

the support of an MKO . This approach contrasts with traditional methods that often focus on tasks within the learner's current level of competence. By challenging learners within their ZPD, teachers can foster deeper understanding and more robust learning. Scaffolding techniques, such as prompting, modelling, questioning, and providing feedback, are essential to effectively operating within a learner's ZPD. These methods help learners internalise new concepts and skills, eventually enabling them to perform tasks independently.

Importantly, the ZPD highlights the importance of ongoing and formative assessment in the learning process. Through ongoing assessment, teachers can identify the current developmental stage of a learner and provide appropriate support to facilitate progression within the ZPD by continuously adapting teaching strategies to the evolving capabilities of the learner.

3.2.5 Scientific and Spontaneous Knowledge

Vygotsky's distinction between spontaneous and non-spontaneous concepts is essential in understanding how children develop understanding and knowledge (Howe, 1996). Spontaneous concepts originate from outside the formal educational system and often stem from everyday experiences, interactions, and observations in the child's environment. Vygotskiï and Kozulin (1986) maintained that these concepts exist in the child's mind before formal education and awareness. They are part of the child's spontaneous understanding of the world and are not explicitly taught. The development of spontaneous concepts tends to progress upward. This suggests that children initially acquire basic, concrete understandings through every day experiences and gradually build on them, moving towards more abstract and complex understandings over time.

In contrast, scientific concepts develop within the formal educational system (Daniels, 1996). They are taught deliberately within an educational context and typically involve more abstract or specialised knowledge. These concepts develop within the educational system, where they receive explicit instruction, awareness, and intention. The development of scientific or non-spontaneous concepts is described as proceeding downward. This implies that formal education often begins with abstract or specialised concepts and systematically breaks them down into more concrete and understandable components for learners.

The terms “spontaneous concept” and “scientific concept” are synonymous with an elaboration of Vygotsky’s “double stimulation” method that emphasises the interconnectedness of spontaneous and scientific knowledge. They encapsulate Vygotsky’s concept of the double stimulation method, which highlights the relationship between spontaneous knowledge and formal, scientific knowledge. This concept is fundamental to this study’s overarching objective, which is rooted in practical applications within the ZPD.

The double stimulation method, as explained by Vygotsky, suggests that the development of higher cognitive functions occurs through the interaction between spontaneous and scientific concepts. This process involves two stages: first, individuals encounter new concepts through formal instruction or exposure to scientific knowledge; second, they integrate these concepts into their existing understanding, reshaping their spontaneous concepts to align with the more abstract and systematic scientific concepts. The interconnectedness of spontaneous and scientific concepts is pivotal to understanding human cognition and learning within the ZPD.

By recognising the relationship between spontaneous and scientific concepts, teachers can facilitate learning experiences that scaffold learners’ understanding, guiding them through the process of transforming spontaneous knowledge into more sophisticated scientific understanding. This approach allows learners to build on their existing knowledge while gradually expanding their cognitive capabilities within the ZPD.

Understanding the interplay between spontaneous and scientific concepts allows teachers to create effective scaffolding strategies. By recognising and building on learners’ spontaneous knowledge, teachers can guide them towards more sophisticated scientific understanding, thereby expanding their cognitive abilities within the ZPD. This approach emphasises the importance of connecting everyday experiences with formal education to foster comprehensive cognitive development.

3.2.6 The Activity System

Vygotsky’s sociocultural theory is elaborated through the concept of an activity system, which is a framework used to understand how human activities are socially and culturally mediated. The activity system is composed of several interrelated components, each playing a crucial role in the learning and development process. Each component of the

activity system interacts dynamically with the others, creating a complex network of relationships that influence learning and development (Daniels et al., 2010). By examining these components, Vygotsky's sociocultural theory provides a comprehensive understanding of how cognitive processes are deeply embedded in social and cultural contexts. This framework helps teachers and researchers analyse and design educational activities that foster meaningful learning experiences.

A foundational concept in CHAT is Vygotsky's notion of "mediated action". Drawing on the collaboration with and writings of Luria (1960), Vygotsky proposed that human actions and psychological processes are influenced by tools, encompassing both physical tools that manipulate objects and psychological tools that facilitate interaction between the mind and the environment – with emphasis on language being the key component making us uniquely human (Bodrova & Leong, 2019). Based on Luria's work describing how humans distinguish themselves from animals by their capacity to create and utilise tools, Vygotsky suggests that these tools not only profoundly alter their environment but also have a reciprocal influence on humans, affecting their psychological state.

In the absence of words, human beings would have to deal only with those things which they could perceive and manipulate directly. With the help of language, they can deal with things that they have not perceived even indirectly and with things which were part of the experience of earlier generations. (Luria, 1960, p. 35)

This concept of "mediated action", represented by the "M" (refer to Figure 3.1), is typically depicted through a triangular framework comprising the subject, the mediating artefact or tool, and the object, with the vertices of the triangle representative of the confines of the human mind (Cole & Engeström, 1993; Cong-Lem, 2022; Engeström, 2000; Roth, 2014). The subject is the individual or group engaged in the activity. In the context of learning, the subject is typically the learner or learners who are interacting with the environment and the tasks at hand.

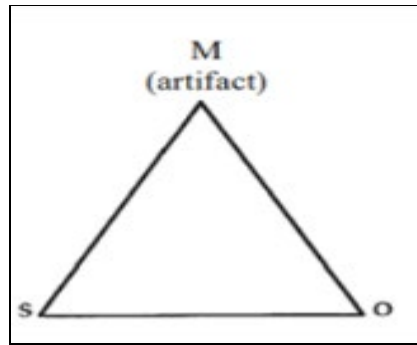


Figure 3.1: Basic Mediation Triangle

Source: Vygotsky and Cole, 1978, p.5

Whereas, in the basic mediational triangle, the object represents the goal or purpose of the activity. It is what the subject is working towards or trying to achieve. The object gives direction and meaning to the activity and is central to understanding the motives behind actions. Tools are the instruments or means used by the subject to interact with the object. They can be physical objects, such as textbooks and computers, or psychological tools, like language, symbols, and concepts. Tools mediate the relationship between the subject and the object, shaping how the activity is conducted.

This basic mediational triangle was later expanded to include additional components intersecting with the activity system. This was necessary because, according to Cole and Engeström (1993), this depiction failed to account for the collective component which forms part of the mediational triangle (refer to Figure 3.2). The collective community encompasses the social group or network that the subject is part of while engaging in the activity. This might include peers, teachers, family members, and any other individuals who share the same general object and can influence the activity through social interactions and cultural norms. Rules are the norms, conventions, and regulations that guide the activity within the community. They can be explicit or implicit and help define acceptable behaviours and interactions within the activity system. Rules ensure that activities are carried out in a socially and culturally appropriate manner. They do not exist in isolation but develop within cultures and communities over time. As such, rules can either contribute towards harmony within the activity system or provide a disruption, thereby making the activity system unstable. This, in turn, sets change in motion, which in the ZPD can bring growth and further development (Engeström, 2011).

The division of labour refers to the distribution of roles and responsibilities among community members. It delineates who does what within the activity system and how tasks are organised and coordinated. This component highlights the collaborative aspect of activities, where different individuals contribute in various ways to achieve a common object. The outcome is the result of the product of the activity; it is what is ultimately achieved through the interaction of the subject with the object, using the tools within the framework of rules and community structure. Outcomes can include new knowledge, skills, or changes in the environment or social structure. However, this component also reveals the detrimental impact that capitalist societies engender and which leads to significant socio-economic consequences such as exploitation and alienation (Ko et al., 2021; Stetsenko, 2019, 2022; Vianna & STETSENKO, 2014).

As shown in Figure 3-2, these components have been strategically placed into the activity system as follows: “natural” (or “unmediated”) functions are represented along the base of the triangle, while “cultural” (or “mediated”) functions occur where interactions between the subject and object are facilitated by a secondary means, situated at the vertex of the triangle.

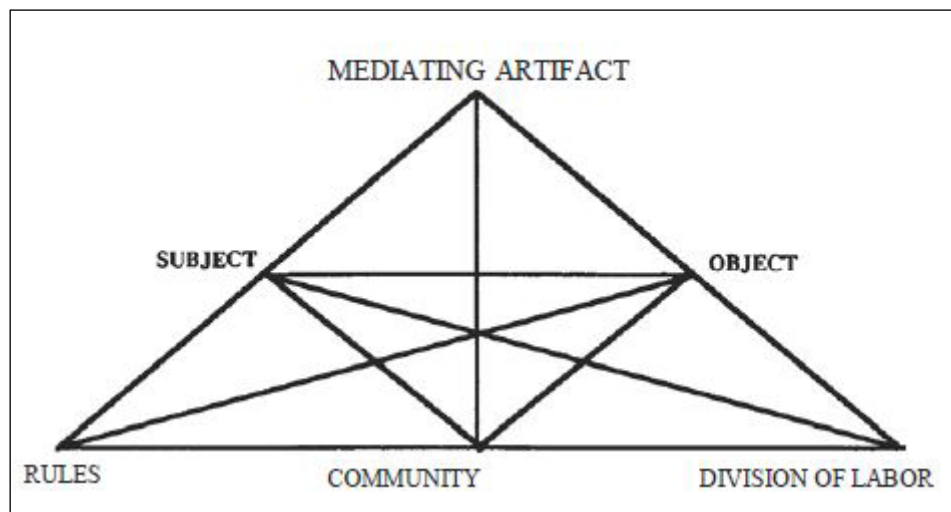


Figure 3.2: Adapted Mediation Triangle

Source: Cole and Engeström (1993)

These cognitive processes are illustrated by the model of a mediational triangle. This model distinguishes between “natural” functions, performed without mediation, and “cultural” functions, which involve the use of tools (Kozulin, 2018). Thus, cultural artefacts, norms, and practices also mediate human activity by providing frameworks for

understanding and organising behaviour. These cultural “mediational means” shape individuals’ respective perceptions, values, and goals, influencing the way they engage in activities. Likewise, language, symbols, and other forms of communication serve as mediational means in human activity. They allow individuals to convey and interpret meaning, facilitating coordination and collaboration within activity systems whereby confirming that cognition does not lie solely within the individual but rather stems from distributed cognition within the activity system itself (Cole & Engeström, 1993).

3.2.7 Implications of Vygotsky’s Work

Vygotsky’s concepts such as the ZPD and scaffolding have been widely used in educational research and have contributed to a better understanding of learning and development. For example, the concept of scaffolding (that is, where an MKO provides support or guidance to a learner, and then gradually reduces the assistance as the learner gains competence), highlights the importance of supportive interactions in the learning process (Cong-Lem, 2022). Vygotsky’s theory supports the idea that learning is a social activity. Collaborative learning, where individuals work together to solve problems or achieve common goals, is seen as beneficial for cognitive development. This has implications for educational practices that promote collaboration and peer interaction.

Moreover, Vygotsky viewed play as a crucial element in a child’s cognitive development. He saw play as a ZPD where in a supportive environment children can practice and consolidate newly acquired skills. This has implications for the importance of play in early childhood education argue Bodrova and Leong (2019) and they emphasise the significant role that social interactions and cultural tools have in shaping processes when play is prioritised. Engeström and Sannino (2021), in tracing the development of activity theory, emphasise that Vygotsky did not specify an activity system as a unit of analysis – even though he sporadically wrote about “systems of activity” and that rather, he was concerned with cultural mediation as the unit of analysis. Importantly, Vygotsky demonstrated the concepts underpinning the unit of analysis with overt attention to the historical transformation of human practices that modify and adapt artefacts (tools) over time and stemming back to the views of Marxism reminding us of the ever-present and evolving influence of materialism. In the following section, the focus shifts to the development of CHAT, which continues to explore the role of activity systems through the CHAT framework.

This first section began by exploring key elements within Vygotsky's developmental framework. This included an examination of the process of internalisation, emphasising the general genetic law and its role in cognition. The importance of language and speech as mediating factors in learning was highlighted. In the discussion in this section, the role of mediation in facilitating learning was explained. Various forms of support, such as teachers and tools, were discussed as mediators in the internalisation of knowledge. The section concluded with an in-depth exploration of the ZPD, characterising it as the "teachable space" that contributes to scaffolding in the learning process.

3.3 SUBSEQUENT WORK AND GENERATIONS

In this section, the discussion moves on to tracing how Vygotsky's mediated learning from the first generation, was transformed in the subsequent four generations of activity theory to result in CHAT. The latter is a framework for understanding how individuals and communities engage in activities within their respective social and cultural contexts. It is important to locate the historical development of CHAT, thereby acknowledging its roots in Vygotsky's sociocultural theory and subsequent contributions from other scholars. The theory has evolved with different generations of scholars building theory on the relational dynamics of networks existing in activity theory.

The first generation of Activity Theory primarily focused on the individual's cognitive development within a sociocultural context. Vygotsky's emphasis at that stage on the role of social interactions and cultural tools in shaping cognitive processes laid the foundation for later developments in activity theory. The second generation emerged as psychologists such as Leont'ev, Elkonin, and Luria (all colleagues of Vygotsky) expanded on his work (Bodrova & Leong, 2015).

The generation of activity theorists emphasised the collective nature of human activity, highlighting that individuals always operate within a network of interrelationships. Leont'ev (1978) laid the foundation for this perspective with his three-level model of activity that delineates activity, action, and operation as separate components. According to Leont'ev's hierarchical framework, activity is then further structured across three tiers: the activity level, which pertains to the object or motive of the action; the action level, which focuses on the goal of the action; and the operation level, which encompasses the practical conditions necessary to achieve the goal. In this conceptualisation, each activity

possesses a distinct object, and individual actions are invariably oriented toward specific goals while being influenced by the surrounding operational context. Leont'ev put forward that even solitary actions are inherently communal, as they are embedded within a broader framework of societal norms, tools, and division of labour. Thus, individuals engage in various activities aimed at specific objectives always operating within a communal context that shapes their actions.

Elkonin, a contemporary of Vygotsky, furthered Vygotsky's research on play and crafted an extensive theory that became foundational for a prominent branch of Soviet psychology and education. Elkonin's framework facilitated investigations into play among children exhibiting diverse cognitive, linguistic, and emotional challenges, as well as examinations of how distinct mental processes are reflected in play and analyses of social growth (El'Konin, 2005). Moreover, Elkonin's theory underpinned instructional methods employed in numerous preschool and kindergarten settings, benefitting both typically developing youngsters and those requiring specialised support (Bodrova et al., 2013).

Importantly, Elkonin outlined four primary ways through which play supports the acquisition of mental tools and the progression of higher mental functions. These contribute to supporting Vygotsky's notion of play being central to learning and development, with mediation as a mechanism for self-regulation (Bodrova & Leong, 2015).

Initially, play influences a child's motivation by engendering an intricate hierarchy of short-term and long-term goals. This entails occasional sacrifices of immediate objectives to achieve overarching aims, fostering awareness of one's actions and transitioning from reactive to intentional behaviours. Second, play facilitates cognitive "decentring", crucial for navigating diverse roles and negotiating play scenarios by understanding others' perspectives. Moreover, children learn to adopt their playmates' viewpoints, a manifestation of cognitive decentring. Third, play promotes the development of mental representations, separating object meanings from their physical forms. Lastly, play nurtures intentional behaviours, encompassing voluntary physical and mental actions. The development of intentionality in play stems from the child's adherence to play rules (Bodrova et al., 2013). This generation of scholars introduced key concepts such as "activity system" and "subject-object" relationships. The emphasis shifted towards the

analysis of collective activities within a social context, examining how individuals and communities interact with their environment.

The third generation built upon the work of Vygotsky and Leont'ev, aiming to reconcile the individual and collective aspects of human activity (Klen-Alves, 2021). While Vygotsky focused on how individuals use mediating tools to achieve objectives and Leont'ev expanded this to include collective activity, neither fully explored the dialectical relationship between individuals and collectives. Engeström's contributions popularised CHAT as a theoretical framework and method of analysis, laying the foundation for the third generation. The latter generation emphasised a sociocultural understanding of activity theory, recognising activity as both individually and collectively produced, shaped by historical and cultural contexts (Klen-Alves, 2021). Led by scholars including Engeström, the third generation expanded the scope of activity theory to include socio-political and historical dimensions (Engeström, 2018). The focus shifted towards understanding larger systems of activity and how they are influenced by societal structures and contradictions. Engeström introduced the concept of "expansive learning", highlighting the transformative potential of learning within complex activity systems (Engeström, 1987).

The (current at the time of writing) fourth generation involves the application and integration of activity theory in various fields such as education, organisational studies, and human-computer interaction (Engeström & Sannino, 2021). In addition to tracing the unit of analysis, Engeström and Sannino (2021) also consider the concept of agency and its historical development, first with agency involving the grasping of historical and emancipatory possibility, second with agency as collective transformation, third with agency that is negotiated through recognition of differences and similarities, and lastly, with transformative agency by way of double stimulation.

Engeström and Sannino (2011) position the reader in relationship to the grounding principles of activity theory. They describe the trajectory of activity theory through the different generations that have built on Vygotsky's legacy of CHAT writings; each generation adapts and builds on the activity system as a unit of analysis. There is a keen focus on the multi-facetedness of activity theory in tracing its roots as well as in describing its' inherent dialectical, activist nature. In doing so, Sannino and Engeström (2018)

demonstrate the duality of activity theory that serves both as a unit of analysis and a theoretical framework to understand and transform societal practices.

Through the use of case studies, Sannino and Engeström demonstrate the concepts underpinning the unit of analysis. They pay overt attention to the historical transformation of human practices that modify and adapt artefacts (tools) over time, reminding us of the ever-present and evolving influence of materialism. This stems back to the views of Marxism where the concept of value and exchange determines how individuals and communities view and act upon material items. In such a way, Sannino and Engeström (2018) argue for the inclusion of the term “historical” when working with activity theory, stating that by omitting this aspect, the situated activity is devoid of relevance.

Commenting on the works of Sannino and Engeström towards the 4th generation of activity theory, Stetsenko (2021) argues that authorship requires a more radical, less passive acknowledgement regarding the turmoil in society stemming from neoliberal trends and capitalism. She adds that, in order to strengthen their writing, researchers in the field of CHAT need to stop practicing being “naively objective”, but rather position themselves and take a stance against the ever-present structural racism and global inequality (Stetsenko, 2021, p. 4).

3.4 ENSUING CONCEPTS

In this sub-section, the discussion highlights new concepts emerging from the ongoing studies in the field of CHAT.

3.4.1 The Object of Activity

CHAT theorists maintain that without objects, activity systems are devoid of meaning: there cannot be an object without activity and conversely, activity without an object (Cole & Engeström, 1993; Foot, 2001; Penuel & Wertsch, 1995; Sannino & Engeström, 2018). There is always a tension between the object that calls for action and the activity which requires agency to act on and mould the object. Although individuals may act differently on an object, based on the needs and rules of the system, the object remains a generalised entity with a common feature providing the initial impetus for action (Foot, 2014).

The object serves as a mediating factor in human activity. It is the goal or purpose that individuals pursue through their actions. The object mediates the relationship between the

subject (individual or group) and the tools, signs, and other elements in the activity system. The pursuit of an object directs and shapes the entire activity. Objects in CHAT are dynamic and can transform. As individuals engage in activities, the nature of the object may evolve, leading to changes in the activity system. The presence of agency is a pre-requisite to mould the object, as the object calls for action, but inherent qualities of the object imply that to some extent, the object remains a generalised entity whereby individuals use and interact with the object in different ways

According to Stetsenko (2005), to find the true motive of the activity, one needs to research the activity by inhabiting the activity. This emphasises the social aspect of learning and development within CHAT. Further attention needs to be placed on emphasising the interconnectedness of elements within the activity system, often referred to as nodes (such as subjects, tools, rules, and the division of labour) within a specific social and cultural context (Roth, 2014).

It is important to make the observation that in CHAT, the unit of analysis has expanded from being a single unit to being a network of activity systems. This dynamic quality highlights the interconnectedness of the components within the system and the ongoing development of both the individual and the collective. Objects are not only individual goals but can also be collective or social. In collaborative activities, a shared object may emerge that reflects the goals and aspirations of the entire community or group.

3.4.2 Dialectics and the Germ Cell

In the context of CHAT, the concept of the “germ cell” is critical for understanding and analysing the development of complex systems and activities. The *germ cell* in CHAT refers to a fundamental simple unit, or core idea from which the complexity of an activity system can be developed and understood. It is analogous to a biological germ cell in that it contains the essential characteristics and potential for the full development of the system. Vygotsky introduced the concept of *genetic analysis*, which involves understanding the development of psychological functions by tracing their origins and transformations (Vygotsky, 1931). This idea later influenced the development of the germ cell concept as it seeks to identify the fundamental unit of development within an activity system.

Leont'ev introduced the idea of the *unit of analysis* in understanding activity systems. This unit should be a microcosm that contains the essential characteristics of the entire system (Leont'ev, 1978). The germ cell can be seen as a refined version of this unit of analysis, embodying the core contradictions and dynamics of the activity. Engeström's work brought the germ cell concept to the forefront of CHAT. He used it to model the developmental potential of activity systems, identifying fundamental contradictions and core interactions that drive development. The germ cell, in Engeström's framework, serves as a starting point for understanding and fostering expansive learning processes within complex systems (Engeström et al., 2012). It starts by identifying core contradictions, followed by historical and empirical analysis, and culminates in isolating a simple, representative unit that embodies the essential dynamics of the system.

According to Engeström et al. (2012), the germ cell is key to the successful outcome of long-term change and is at its' core essential for sustaining life, referring to *escorted transfer* to describe the process of moving to a better place through deeper understanding. Once identified through the process of dialectics, the germ cell can lead to taking action as the meaning comes from shifts in thinking which are mobilised by dialectical engagement, abstraction, and thinking. Subsequently, changes are often brought about concretely by practical experimentation, small investments of incremental change in the knowledge that mobilising understanding and new ways of thinking is not always tidy but has the potential to move us in a real way (Sannino, 2011).

This dialectical engagement involves discursive manifestations which appear in four ways, namely: dilemmas, conflicts, critical conflicts, and double binds in discourse (Engeström & Sannino, 2011). The concept of discourse addresses the relationship between language and meaning through dialectical iterations. A discourse consists of a web of statements, categories, beliefs, habits, and practices. It serves as a lens through which we filter and interpret our experiences. The discourses available at a particular historical moment shape how people can think, talk about, and respond to phenomena. They influence how we perceive our humanity and how we interact with others (Ryan, 2006).

To arrive at the germ cell, it is important to define and characterise each of the aforementioned manifestations. *Dilemmas* refer to situations in which the subject is faced with a choice between two or more options, each of which has both positive and negative

aspects. The individual often feels torn between conflicting values or goals, making it challenging to make a decision that satisfies all aspects of the situation. For example: a teacher might face a dilemma when deciding between recording a mark on an assessment report. This is despite them knowing that this mark is not an accurate reflection of the learner's ability – but they feel obliged to follow the prescribed assessment protocol. The protocol does not align with their personal value system and understanding of each child who needs time to develop at their own pace.

Double binds occur when a person receives conflicting messages or demands, leaving them in a situation where it is impossible to meet the expectations of both messages. Double binds often characterise a sense of being trapped or experiencing a no-win situation, because complying with one message contradicts the other. An example is when a teacher is guided to use play-based learning as a means of instruction, yet they are required to submit formal test scores for reports at the end of the term in each of the three learning areas. Engeström and Sannino (2011, p. 375) describe double binds as option limiting: “*Double binds* are processes in which actors repeatedly face pressing and equally unacceptable alternatives in their activity system, with seemingly no way out”.

Conflicts arise when there is a disagreement or clash between two or more parties regarding goals, values, opinions, or resources. Conflicts can occur at various levels, ranging from interpersonal conflicts between individuals to larger organisational or societal conflicts. For example, a team of teachers might experience a conflict over different approaches to testing for number concept development, where one teacher argues that writing the numeral is essential, whereas the other teacher argues that this is linked to emergent writing and not knowledge of number per se.

Critical conflicts typically refer to conflicts that have a significant impact on individuals or groups involved, often involving high-stakes or fundamental issues. Critical conflicts may have long-lasting consequences and require careful resolution to prevent further escalation or harm. For example: a critical conflict could be a legal matter with serious implications for the parties involved, such as a teacher noticing that a learner is suffering physical or sexual abuse from a parent or close family member.

Engeström and Sannino (2011) have shown, through their work in the Change Laboratory, that these four manifestations cannot be used interchangeably, as they occupy

different “temporal spaces” (with conflicts and critical conflicts being more closely associated with long-term undertakings or interventions, whereas dilemmas decrease over sessions, indicating a temporal dynamic).

The use of germ cell models that integrate concrete, situated knowledge into abstract knowledge in developmental teaching was discussed by Hedegaard (2020). Hedegaard demonstrated the process of ascending from the abstract to the concrete by presenting a design experiment to illustrate the importance and complexity of using germ cell models in teaching. This entailed connecting different subject areas by starting with primary substantial abstractions and gradually moving towards complex matters. The teaching process involved guiding learners’ understanding through tensions and questions that arise from their environment, using the germ cell as a tool for analysis and qualification of their understanding.

Hedegaard and Chaiklin (2005) emphasise the importance of guiding teaching activities based on the germ cell models and learners’ core models, with particular attention to motive formulation, learning activity, and reflection. Concerning this, Hedegaard discusses the “double move”⁶ approach to teaching, which was inspired by Vygotsky’s theory of the ZPD. The approach involves relating the objective of the subject area to learners’ interests and motivating them to explore and learn, thereby making use of the radical-local approach in teaching. To engage learners and teach central concepts, this incorporates local cultural backgrounds

3.4.3 Contradictions

Central to CHAT is the exploration of contradictions, a key process for comprehending the intricacies of human activity. Engeström (2005) categorises these into primary, secondary, and tertiary contradictions. *Primary contradictions* are the inherent tensions within a specific activity system, stemming from the complexity of human activities and the competing motives of individuals or groups involved. In CHAT, a primary contradiction might arise from the clash between an individual’s goals or motives and the societal or cultural norms within a specific activity system. This contradiction often involves a fundamental tension that drives development and change within the activity

⁶ Not to be confused with the double-bind

system. Resolving the primary contradiction typically requires transformative shifts in the practices, tools, or divisions of labour within the activity system (Foot, 2001).

Contradictions, far from being negative, are viewed as potent forces propelling development within an activity system. The attempt to resolve primary contradictions gives rise to *secondary contradictions*, which, like a domino effect, leads to *tertiary contradictions* and an ongoing developmental process. Resolving contradictions becomes a catalyst for the transformation of individuals and their cultural practices (Roth et al., 2012).

Sannino and Engeström (2018) exemplify how contradictions manifest and evolve in the activity system, with their roots consistently linked to capitalism. Unravelling this link is crucial, enabling the examination and exposure of capitalism through the lens of CHAT. Capitalist production, as revealed, induces the alienation of workers from their labour's products, the production process, and even their human potential. This contradiction underscores the profound impact of capitalist relations on the psychological and social well-being of individuals. The source of a primary contradiction creates tension, prompting individuals or groups to seek resolutions, setting in motion a ripple effect of secondary, tertiary, and quaternary changes.

Sannino and Engeström (2018) purposefully place the descriptions of these contradictions under the umbrella of “dialectics”, illustrating how contradictions materialise when articulated or acted upon. To address the tension (rather than merely to counteract it) often necessitates a third dimension. Faced with a problem, human subjects intentionally respond to the initial stimulus, referred to as “double stimulation”, altering the course and nature of the activity to arrive at more suitable solutions. Engeström and Sannino (2011) stress that resolving primary contradictions is far from straightforward and may give rise to new tensions and contradictions. This implies that contradictions within an activity system are not inherently obvious but become evident through articulation or action. Framing these contradictions in a dialectical context acknowledges that resolving them often requires introducing a new element or perspective (the third dimension) rather than simply opposing or negating the contradiction.

Furthermore, it suggests that when children encounter problems, they can consciously and intentionally engage with the initial stimulus. This deliberate engagement allows

individuals to modify the activity's course and nature, leading to more effective and suitable solutions. This process emphasises the active and transformative role of individuals in resolving contradictions and achieving developmental progress within the system.

3.4.4 The Significance of Moving from Concrete to Abstract

In CHAT, moving from the abstract to the concrete is a fundamental methodological principle founded on a theoretical basis. This process involves starting with broad, generalised concepts and progressively refining them into more detailed, context-specific understandings. In CHAT, the initial phase often involves dealing with abstract concepts such as “activity systems”, “mediation”, and “object-oriented activity”. These abstract notions provide a broad, theoretical framework for understanding human activities. To make these abstract concepts tangible, they must be operationalised. This means defining them in ways that can be observed and measured in concrete terms. For example, an “activity system” can be broken down into its components: subject, object, tools, community, rules, and division of labour (Cole & Engeström, 1993). The significance of this approach lies in its capacity to produce a deep, comprehensive understanding of complex systems and phenomena, such as educational practices and learning processes. Vygotsky's work laid the foundation for understanding the development of higher mental functions from social interactions and cultural tools (Vygotskiï, 1997)⁷. His approach emphasised the importance of moving from abstract theoretical concepts to practical applications in educational contexts. Leont'ev developed the idea of activity theory, emphasising the need to understand the structure and development of activities. He highlighted the process of moving from abstract generalisations to concrete analysis to grasp the full complexity of human activities (Leont'ev, 1978). The significance of this approach lies in its capacity to produce a deep, comprehensive understanding of complex systems and phenomena, such as educational practices and learning processes and this will be explored further in the methodology section.

⁷ The spelling of Vygotsky differs slightly as the citation aligns with the original source but it is the same author.

3.4.5 CHAT Conceptions of History, Culture, and Development

Historicity plays a crucial role in CHAT, as it emphasises the historical and cultural context in which human activities and cognition develop. CHAT describes how human activities and cognitive processes are not static but develop over time. Historicity is central to understanding how cultural and historical factors shape the development of individuals and their cognitive abilities and therefore is closely linked to the concept of cultural mediation. According to CHAT, individuals engage in activities within a specific cultural and historical context. These cultural tools, including language, artefacts, and symbols, mediate and shape human cognition and behaviour. The historical development of these cultural tools is crucial in understanding their impact on individual and collective activities.

CHAT adopts a dialectical approach, acknowledging the dynamic interplay between individuals and their sociocultural environment. Historicity is integral to this dialectical relationship, as it emphasises the ongoing, reciprocal influence between individuals and their historical contexts. Activities are not isolated events but are embedded in broader cultural practices and CHAT involves examining how cultural practices and the use of artefacts evolve. These artefacts and practices shape the way individuals engage in activities and solve problems. Historicity underscores the importance of considering the historical and cultural context in which individuals and communities engage in activities, develop cognitive processes, and use cultural tools. It provides a framework for understanding the dynamic and evolving nature of human activity and cognition.

Artefacts and instrumentality play a significant role in CHAT, contributing to understanding in terms of the framework of how individuals interact with their environment, engage in activities, and develop cognitive processes. CHAT emphasises the concept of mediation, where external tools and symbols mediate human activity and cognition. Artefacts, including physical tools, symbols, and cultural artefacts, act as mediators between individuals and their environment. These artefacts are integral to the cultural and historical context in which activities take place, shaping and influencing human behaviour and cognition. CHAT introduces the idea of instrumental genesis, which explores how tools and artefacts are created and evolve. Both the development and the transformation of instruments are closely linked to the historical and cultural context.

Instrumentality involves not only the physical tools but also the symbolic and cultural tools that individuals use to mediate their activities.

Artefacts serve as cultural tools that individuals employ to achieve their goals in a given cultural and historical context. Language, symbols, and other signs are considered cultural tools that mediate communication and thought. These tools are passed down through generations, contributing to the historical continuity of cultural practices and cognitive processes. CHAT views activities as object-oriented, meaning that individuals engage in purposeful actions directed towards a specific goal or object. Artefacts and instruments become essential components of these activities, serving as a means to achieve the desired outcomes. The choice and use of artefacts are influenced by the historical and cultural context, shaping the nature of the activity. Artefacts contribute to the concept of distributed cognition in CHAT, which suggests that cognitive processes extend beyond individual minds and involve the external environment. Instruments and artefacts serve as extensions of individuals' cognitive processes, aiding in problem-solving and decision-making. The historical development of these artefacts influences how cognitive processes are distributed within a cultural context.

In summary, artefacts and instrumentality are central to CHAT as they mediate human activities, shape cognitive processes, and reflect the historical and cultural context in which individuals operate. The analysis of artefacts and instruments provides insights into the development of cultural practices, the evolution of tools, and the dynamic interplay between individuals and their sociocultural environment.

3.4.6 Expansive Learning and Transformative Agency

Sannino and Engeström (2018) describe the CHAT paradigm, in which the constantly evolving object and the often-obscure nature of contradictions occurring within activity systems provide ongoing challenges for research. Sannino and Engeström emphasise how contradictions cannot be delineated or fully grasped, owing to unique and individual past histories manifesting in current practices. They argue that these contradictions cannot be addressed with quick-fix approaches that counteract the imbalances. They suggest that to transform the contradiction into something more emancipatory, the imbalances need rigorous iterations of dialectical engagement, and sometimes attention that may be uncomfortable. The key theoretical concepts that underpin CHAT overlap with

methodological viewpoints, with many scholars suggesting that this overlapping feature has contributed to the longevity of CHAT. Sannino & Engeström (2018, p. 45) observed: “The scientific mind, on the contrary, views revolution as the locomotive of history forging ahead at full speed, it regards the revolutionary epoch as a tangible, living embodiment of history”.

Of importance here is the notion that expansive learning is about knowledge that is not yet there, and this links back to the first generation where mediation in the ZPD awakened new and undiscovered knowledge.

Stetsenko (2020) advocates for a re-evaluation of associations within shared communities of practice, challenging the notion that autonomy is a culmination of development. She suggests that societies need to resist the status quo, through shared communities of practice, in line with the paradigm of TAS. In a similar vein, Stetsenko (2019) pushes for the notion that creativity associated with transformation should not be assumed to be something only a few (often privileged) have. Rather, the stance should be taken that this is accessible to all, given the right circumstances, whereby ensuring that any progress or change is equitable and sustainable

It is important to first emphasize the amazingly creative, transformative agency that all human beings share and need to gain sociocultural support for. The next critical step should be about how society provides conditions for and supports creativity in all people, especially those who are historically disadvantaged, or fails to do so in putting limits on creativity, at its own great loss and detriment, as unfortunately happens too often today. (Stetsenko, 2019, p. 17)

3.4.7 Application of CHAT to Educational Settings

CHAT provides potential as a strong framework for research in educational settings by offering a holistic lens through which to understand the complex interplay of social, cultural, and psychological factors shaping learning environments (Cong-Lem, 2022; Isaac et al., 2021; Roth et al., 2012). CHAT emphasises the interconnectedness of individuals and their tools within activity systems, fostering a deeper comprehension of educational practices (Dafermos, 2022). Researchers can employ CHAT to analyse the various elements influencing teaching and learning, such as the roles of artefacts, the division of labour, rules, and community dynamics (Foot, 2014). This approach allows

for a “critical” exploration of educational activities, revealing underlying contradictions and tensions that may hinder or facilitate effective learning. By applying CHAT, researchers can identify points of intervention. Thereafter, through the processes of engagement, researchers arrive at practical and meaningful pedagogical improvements. These foster a more inclusive environment that considers the diverse sociocultural contexts in which learning takes place (Kay, 2023).

Researchers continue to refine and adapt activity theory to address contemporary challenges and contexts. The emphasis is on using activity theory as a tool for analysis and design in real-world settings. The progressive generations of CHAT illustrate the evolving nature of activity theory, with each phase building upon and extending the concepts and insights of its predecessors. Researchers continue to engage with and apply activity theory to better understand and address the complexities of human activity in diverse contexts.

3.5 CONCLUSION

In summary, this chapter has detailed the theoretical framework underpinning the study, drawing from CHAT and its roots in Vygotsky’s sociocultural theory and Marxist philosophy. By examining the foundational principles of Vygotsky’s work in the first part of the chapter, we explored the processes of internalisation, the general genetic law, and the critical role of language and mediation in cognitive development. The discussion on the ZPD highlighted how these concepts translate into educational practices, emphasising the importance of scaffolded learning. By understanding the process of internalisation and the role of language and mediation in cognition, teachers can better facilitate learners’ learning experiences. This insight helps in designing interventions that effectively support cognitive development. The concept of the ZPD provides a practical tool for teachers to identify and cultivate the “teachable space” for learners. This can lead to more effective scaffolding strategies, ensuring that learners receive the appropriate level of challenge and support.

The second part of the chapter extended this foundation by tracing the evolution of CHAT through successive generations, illustrating how Vygotsky’s ideas have been expanded and refined. Core concepts such as the object of activity, the significance of dialectics in revealing contradictions, the notion of the germ cell, and the importance of historicity and

artefacts were discussed. Finally, the chapter addressed the concept of expansive learning and its potential to transform educational outcomes. The emphasis on dialectics and uncovering contradictions within CHAT allows teachers to recognise and address underlying tensions in learning activities. This can lead to more dynamic and responsive teaching methods that adapt to learners' evolving needs. The germ cell, as a fundamental unit of analysis, enables teachers to isolate and understand the core elements of complex educational activities. This can guide the design and refinement of educational programmes, ensuring they are rooted in essential learning processes. Recognising the role of historical and cultural contexts, as well as the use of artefacts, enriches the educational experience. Teachers can leverage these elements to create more relevant and engaging learning environments that connect with learners' backgrounds and experiences. The concept of expansive learning highlights the potential for continuous development and innovation in educational practices. By applying this framework, teachers can foster environments that promote lifelong learning and adaptability, preparing learners for future challenges.

Overall, the insights gained from this theoretical framework can lead to more effective and equitable educational practices, particularly in diverse classrooms. By integrating these principles, teachers can enhance playful engagement, learning outcomes, and overall educational experiences.

This comprehensive theoretical framework sets the stage for the subsequent analysis and application within the study, providing a lens through which the interplay between play and emergent mathematics in diverse classrooms can be understood and enhanced

CHAPTER 4

METHODOLOGY

4.1 INTRODUCTION

In the previous chapter, the theoretical framework (namely, CHAT) guiding this study was presented. This was detailed with attention to the various elements with which any given activity system operates, with the explanation including a description of the relational dynamics between these elements. The uniqueness of CHAT is that it fulfils this function in multiple ways; it serves as a theoretical framework and, (arising from the concepts in the framework) the methodological processes emerge, along with an analysis of the structure of the framework. Hedegaard (2008b) argues that pedagogical research requires the theoretical concepts to be aligned and to be reflected within the research design. Hedegaard is of the opinion that this is needed to ensure that any study of this nature is reliable and valid from a methodological point of view. This methodological robustness is accordingly demonstrated throughout this chapter. The success of this study depends on the utilisation of these distinctive features of the CHAT model, informed by the theoretical concepts which allow for analysis and understanding of relations and in doing so, affords meaning.

The research questions are restated at the outset, as they are central to informing the nature of the research methods employed in this study. In addressing the research questions, the research design paradigm unfolds; this entails broad concepts that encompass the beliefs about the nature of reality (ontology), the nature of knowledge (epistemology), and the methods used to gather that knowledge (methodology). CHAT also serves as the philosophical underpinning of the research approach (Cohen et al., 2018). Following this, the *research approach* is described, referring to the overall strategy that a researcher employs to integrate the different components of the study in a coherent and logical way. The research approach ensures the research problem is effectively addressed and motivated. There needs to be a clear and detailed description of how the study was designed, what the research plan entails, and how data was collected and analysed. Finally, the chapter presents the steps to ensuring trustworthiness and ethical research methods.

4.2 RESEARCH QUESTIONS

This research study set out to provide answers to the primary and secondary research questions outlined below.

4.2.1 Primary Research Question

How can a sociocultural model of play-based pedagogy facilitate mathematics teaching in diverse South African Grade R classrooms?

4.2.2 Secondary Research Questions

There are four research questions stemming from the primary research question, adding depth to the nature of the research and analysis.

4.2.2.1 Secondary Research Question 1

What are the current practices of teachers regarding the teaching of mathematics for Grade R learners from diverse sociocultural backgrounds?

4.2.2.2 Secondary Research Question 2

What are the problems, challenges, and potentialities resulting from Grade R teachers' inclusion of play-based pedagogy in their classroom practices of mathematics teaching?

4.2.2.3 Secondary Research Question 3

What could a theoretically informed, yet culturally relevant model for the pedagogy of Grade R learners in diverse sociocultural classrooms in South Africa look like?

4.2.2.4 Secondary Research Question 4

What are the implications and the limitations of implementing a play-based model for teaching mathematics in diverse backgrounds and what further research directions could benefit from both pedagogical and theoretical understanding of such an approach in Grade R classrooms?

4.3 RESEARCH PARADIGM

Creswell and Poth (2016) insist that understanding the research paradigm is crucial for researchers, as it shapes their entire approach to enquiry. This is because the chosen paradigm informs the researcher's ontological and epistemological beliefs, guiding their

understanding of reality and knowledge construction. CHAT falls safely into the category of a qualitative paradigm since that reality is subjective and constructed by human experiences and social contexts (Hesse-Biber & Leavy, 2011). CHAT prioritises the examination of human activities within their cultural and historical contexts, recognising that human cognition and behaviour are deeply embedded in and shaped by social practices and cultural tools (Cole & Engeström, 1993; Foot, 2001; Hedegaard, 2009; Roth et al., 2012). Moreover, reality is constructed through social interactions and understanding these interactions requires a focus on the subjective meanings and experiences of individuals.

For the present study, comprehending the underlying assumptions and principles of CHAT ensured an alignment between methodology, data collection, analysis techniques, and interpretation of findings. At its core, CHAT emphasises the interconnectedness of individuals, tools, artefacts, and sociocultural systems in shaping human activity and development. CHAT views learning and development as social processes that occur through participation in culturally situated activities (Daniels, 1994).

Creswell and Poth (2016) further argue that a clear grasp of the research paradigm enhances the rigour and credibility of the study, facilitating meaningful contributions to the scholarly discourse within their field of enquiry. Key concepts within CHAT include the notion of *activity systems*, complex, interconnected networks of individuals, tools, rules, and community practices engaged in a shared goal-oriented activity. Thus, for qualitative researchers, acknowledging and comprehending the research paradigm is not only essential but also foundational to producing sound and insightful research outcomes.

Closely associated with CHAT is the process of *expansive learning*, the notion that the research is formative and ongoing and working towards future-oriented processes in which the researcher and participants have not yet acquired the handle on “knowledge”. Thus the outcomes are not always clear (Engeström, 2005; Igira & Gregory, 2009). This notion facilitates an approach to data analysis that emphasises future potential rather than fixating on shortcomings. Interviews and case studies allow researchers to explore the nuanced and dynamic processes by which individuals and groups construct meaning and develop over time. The principle of ascending from the abstract to the concrete within CHAT involves moving from broad theoretical constructs to specific, contextually rich understandings, mirroring the interpretivist commitment to capturing the lived

experiences of participants. Additionally, the methodological approach of double stimulation, where researchers observe how participants use tools to solve problems, reflects the interpretivist focus on understanding how individuals interpret and respond to their environments. Therefore, CHAT's goals and methods align closely with the principles of qualitative interpretivism, making it a robust framework for exploring the complexities of human activity and development in context.

4.4 RESEARCH APPROACH

Research approaches in qualitative studies play a crucial role in shaping the trajectory of a research study, guiding researchers in how to conceptualise, design, and execute their investigations (Cohen et al., 2018). With this in mind, the research approach of this study therefore seeks to fulfil the blueprint of this study.

CHAT adopts distinctive features that necessitate the need to describe the design from two standpoints: namely, from an analytical stance and from an interactional stance. From an analytical stance, the focus is on deconstructing the components and structures of the activity system. This involves identifying and examining the key elements such as subjects (the individuals or groups engaged in the activity), objects (the goals or motives driving the activity), tools and signs (the mediating artefacts), rules (the norms and regulations guiding the activity), community (the social context), and division of labour (the distribution of roles and tasks) (Cole & Engeström, 1993; Igira & Gregory, 2009; Roth et al., 2012). By breaking down these components, researchers can analyse how they interact and contribute to the overall functioning and outcomes of the activity system. This stance allows for a systematic investigation of the underlying mechanisms and contradictions that drive the development and transformation of activities.

From an interactional stance, the focus shifts to understanding how these components dynamically interact in real time and within specific contexts. This involves observing and interpreting the actual processes of interaction among participants, their use of mediating artefacts, and their engagement with the social and cultural environment. The interactional stance emphasises the fluid, emergent, and context-dependent nature of human activity, highlighting how individuals and groups negotiate meanings, solve problems, and adapt to changing conditions. This perspective is crucial for capturing the

lived experiences and evolving practices of participants as they navigate and shape their activity systems (Engeström, 2015; Engeström et al., 1996).

The combination of both stances provides a holistic understanding of human activity as conceptualised in CHAT. The analytical stance offers a structural and theoretical framework to identify and examine the critical elements and their interrelations within the activity systems in the Grade R classes. The interactional stance complements this by providing a rich, contextualised account of how these elements come to life through the actual practices and interactions of participants within the classrooms. Together, these stances allow for a comprehensive understanding of both the stable structures and the dynamic processes that characterise activity in its social and cultural context. This dual approach is essential for capturing the complexity and depth of the phenomena studied within CHAT (Igira & Gregory, 2009).

In keeping with the nature of ethnographic work, the analysis consisted of studying and systematically recording observed activity in the three Grade R classes in an authentic, descriptive, and meaningful manner (Cohen et al., 2007). As such, the study was based on perceptual inferences observed within each classroom setting and through the gathering of the Grade R teacher's experiences and struggles, including those that are not so easily articulated, as demonstrated by Vygotsky's writing on the value of indirect observation in understanding human behaviour (Vygotsky, 1997). This was achieved through numerous iterations of focus group interviews and in-depth questioning, to arrive at a realistic understanding of the observations from mental abstractions towards more practical applications (Sannino & Engeström, 2018).

4.4.1 Research Design

In this section, the methodological processes are detailed, and this includes the research design and strategies adopted to address the research questions. The research design includes a description of qualitative research with specific attention to the mediating role of the activity system as well as the research plan that accommodates such endeavours. The strategies detail the carefully executed sampling and selection of participants, the appropriateness of the research site, participant demographics, data sources, data collection techniques, data storage, and analysis.

A *research design* refers to the systematic method or strategy employed by researchers to investigate a particular phenomenon, problem, or question. It encompasses the overall framework, methodology, and techniques used to collect, analyse, and interpret data in order to address the research objectives (Cohen et al., 2018). This section provides details on the aforementioned approaches used to address the research questions guiding this study.

4.4.1.1 Interpretivism

Maxwell (2021b) provides valuable insights into the principles and practices of designing and conducting qualitative research, emphasising the value of qualitative research. This value lies in the ability of qualitative research to explore, interpret, and understand complex phenomena and provide rich and nuanced insights. Maxwell explains how qualitative research is particularly well-suited for studying social and cultural contexts, human experiences, and the meaning individuals attribute to their experiences. *Interpretivism* supports qualitative research by emphasising the importance of understanding the subjective meanings and experiences of individuals within their social and cultural contexts. This paradigm suggests that reality is constructed through human interactions and is thus inherently subjective and context-dependent and importantly, the researcher is part of the process (Hesse-Biber & Leavy, 2011). Interpretivism emphasises the need to study phenomena within their natural settings to understand the context-specific dynamics and complexities, aligning well with qualitative research's goal of providing rich, detailed descriptions. Interpretivism supports a holistic examination of phenomena, considering multiple factors and their interconnections. The uncovering of comprehensive insights is a strength of qualitative research.

Through a meta-analysis of research based on qualitative enquiry, Maxwell highlights many strengths for developing and improving policy and programmes (among other areas) (Maxwell, 2021a). He describes how in-depth exploration into a particular phenomenon provides a comprehensive understanding of the context and the perspectives of the participants. Moreover, the flexibility of qualitative methodology allows researchers to adjust their approach based on emerging insights during the research process. Maxwell's work emphasises the importance of constructing meaning through the process of research; in other words, meaning is created, not found. Through thoughtful and collaborative work, researchers are able to navigate the complexities of data

collection, analysis, and interpretation. This design informed the nature of the iterative cycles of observations and interviews at Windy Meadows.

4.4.1.2 The Activity System as a Unit of Analysis

In the previous chapter, the activity system was covered from a theoretical point of view – explaining how individuals, tools, community, and rules interact within a given context to shape and transform activities. At the heart of CHAT is the notion of an activity system, which consists of several interconnected elements. The activities are driven by objectives and are continuously evolving through the interplay of these elements. This framework helps in analysing and designing interventions to improve practices and outcomes in various settings

As highlighted in the previous chapter, the activity system model is unique in the sense of its duplicity in addressing both theoretical and methodological elements simultaneously. The analysis assumes the crucial role of locating and extracting contradictions to orientate, organise, and direct the trajectory of a study. This involves examining these elements and their relationships to gain insights into the dynamics of human activity (Cole & Engeström, 1993). The first step in analysing an activity system is to identify the specific activity or activities under consideration. Then it is important to identify the different elements operating within the activity such as the subject (the teachers), the object (the learners and learning), the tools/mediation (the physical and conceptual resources used to accomplish the activity), rules (implicit or explicit guidelines governing the activity), the community (social context in which the activity takes place) and the division of labour (the distribution of tasks and responsibilities within the activity system).

Once the elements are identified, the process of mapping the relationships between the elements can begin. For example: how do the tools shape or mediate learning and how do the rules impact the style of teaching? Importantly, CHAT emphasises the historical and developmental aspects of human activities. By tracing the evolution of an activity, one can understand how an activity is shaped in response to internal and external factors (Cole & Engeström, 1993).

The activity system was a key tool used for analysing and understanding the nature of activity at Windy Meadows and ultimately. As described in the previous chapter, the

system assisted in identifying the germ cell, thereby locating the root cause of the unstable activity system (Fleer, 2011).

In the present study, contradictions surfaced in the data gathered the extensive observation period, and the data obtained via document sampling, individual and focus group interviews, events, conversations, and interviews with the teachers. These contradictions encapsulate the unstable activity system and were the key drivers of change in the research process (Foot, 2014). This data was sorted and presented in various themes that addressed the research questions. The thematic arrangement and the analysis of the contradictions not only answered the research question but also informed the basic structure and nature of the initial and subsequent interview processes with the Grade R teachers.

4.4.1.3 Research Plan

In this section, the research plan is detailed using a timeline and study phases. This study consists of five phases (refer to Figure 4.1) to allow time for theory–praxis cycles to evolve and for analysis and reflection to be meaningful. These cycles were iterative processes that generated change and kept the research process moving forward. After proposal approval and the successful completion of the ethics application process, the empirical work commenced. To get a deep understanding of the nature of the research problem (as the nature of qualitative, ethnographic studies assumes), a full day of fieldwork once a week for a term was required. Additionally, the justification for full research days (rather than just for a portion of the day) was due to the Grade R daily programme being integrated and consequently emergent mathematics could occur at any given time (DBEa, 2011b). It should be noted that Phase 4 took additional time because of taxi and university strikes which disrupted the learners’ and teachers’ transport to school delayed the process by four weeks.

Phase 1 began in June 2022 with visits to the classes over six weeks with two days in each of the three classes. During that time, the visits consisted of data collection and observation (detailed in the research method section). Phase 2 followed the observations and consisted of two parts: first the analysis of initial findings and second the subsequent individual teacher interviews. Phase 3 of the study commenced thereafter at the start of August 2022. With the support of the CHAT model’s activity system (Engeström, 2011) to guide analysis, the individual interviews were transcribed and analysed into codes and

subsequent themes, by cross-referencing the findings with the components of the activity system to structure and frame the qualitative inputs. These themes were then matched against the observations to create a deeper understanding of the findings, which resulted in subsequent visits to the three classes for purposive observation to gain greater clarity.

Phase 4 began in October 2022 and focus group sessions were scheduled with the Grade R teachers every ten weeks to create a space for reflection on discussion points and findings concerning their practices. In line with the double stimulation of CHAT, the focus groups also allowed for conversations about how best to adapt teaching and learning spaces. This was done in cognisance of the importance of being patient when evaluating progress; as cautioned by Schoenfeld (1999), researchers working in collaboration with schools must be aware that change takes time and that results may take a long period to become evident. Schoenfeld (1999) further suggests that researchers need to focus on building trust and breaking down fear of judgement. Similarly, Hedegaard (2008b) emphasises that immersion within the educational setting over an extensive period is key to qualitative research. The entire process (including the analysis of follow-up focus group meetings) concluded in October 2023; thus the final thesis study was fully accounted for in the first half of 2024 (Phase 5).

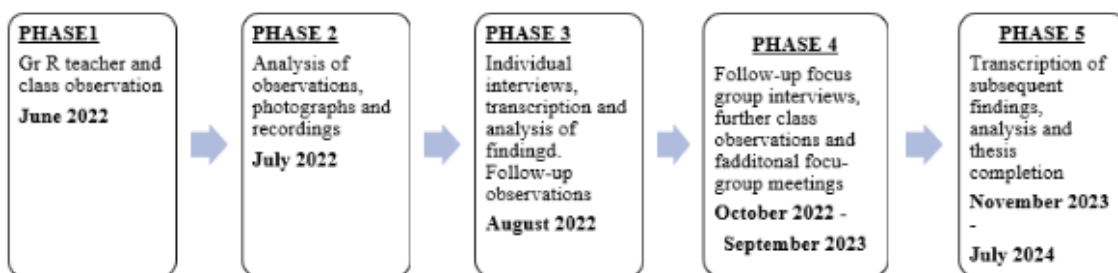


Figure 4.1 Research Plan

4.5 RESEARCH METHODS

This section outlines the methodology employed in conducting the research, including details on participant sampling, data collection procedures, and data analysis techniques – all of which were instrumental in generating answers to the research questions and providing a full picture of the culturally situated practices at Windy Meadows. The section further details the procedures undertaken to conduct the empirical

investigation guided by the BERA ethical and professional standards guiding this study (BERA, 2018,). This includes transparent descriptions of sampling techniques, research settings, participants, data collection and research tools, analysis, and associated ethical considerations.

4.5.1 Sampling of Participants

Sampling is a critical component of research design and involves the process of selecting subsets from a larger population for a research study. The following section describes how the participants for this study were selected, the sample size, selection criteria, and processes that were operationalised.

The three Grade R teachers were selected by using non-probability, purposive sampling. This technique involves the deliberate and strategic selection of specific participants, based on their relevance to the research question and objectives (Bezuidenhout et al., 2014). As such, the key criteria for this sampling process revolved around teachers working with Grade R learners from a diverse composition of backgrounds, ethnicities, genders, cultures, and languages. The selection of such an environment was therefore suitable for addressing the research question. Moreover, their trajectories to becoming teachers were varied, as well as their degrees of experience (refer to Table 4.1). The justification for the criteria for the selection of the participants was that these characteristics were accessible and could be determined before beginning the research process. However, in keeping with the nature of ethnographic work, it must be emphasised that the findings from these contexts are not generalisable. The participant profiles are covered in the ensuing sections.

The sampling decision-making process warrants further clarification, particularly regarding why only three teachers ultimately participated, even though permission had been sought to include four. The proximity of the three classes proved advantageous, as it facilitated the scheduling and coordination of focus interviews, making the research process more efficient and accessible.

4.5.2 Research Setting

Selecting the correct research site is critical in studies of an ethnographic nature, as the site influences the data collection and insights provided by the participants. The participants themselves are also part of the setting (Cohen et al., 2018). Windy Meadows

Primary⁸ was purposively selected for this study because this site gave access to three Grade R classes and their respective teachers. Moreover, the criteria informing the selection of this research site were motivated by the research objectives and questions. These specified the need to explore a rich data set with a composition of Grade R learners from diverse backgrounds within the South African context (Bezuidenhout, 2014). In keeping with the qualitative methodology of the CHAT research paradigm, the success of this study depended on understanding interaction and learning in as natural a manner (and setting) as possible.

This school where the research was carried out is in Kensington, situated on the periphery of the central business district of Cape Town (Western Cape, South Africa). Windy Meadows is a co-educational Section 21⁹ (public fee-paying) school. The medium of instruction is English and there are three classes per grade from Grade R to Grade 7 with approximately 28 learners in each class. The approximately 746 learners are from nearby informal settlements with school fees in the region of R1 400 per annum. The researcher avoided referring to quintile¹⁰ ratings in the study, owing to their accuracy often being critiqued for being problematic for determining socio-economic status (Maistry & Africa, 2020).

4.5.3 Research Participants

Three Grade R teachers formed the primary unit of analysis in this study. The teachers were given pseudonyms for their protection, as guided by BERA (2018) standards, and were referred to as Teacher A, Teacher M, and Teacher A. The three teachers had only taught at Windy Meadows and had varying level ratings of qualifications (refer to Table 4.1).

Table 4.1: Teacher Profiles

EDUCATOR	QUALIFICATION	NATIONAL QUALIFICATIONS LEVEL	EXPERIENCE	HOME LANGUAGE

⁸ This is a pseudonym to protect the school, staff, and pupils.

⁹ Section 21 schools are permitted to charge school fees and manage their own finances and decision - making related to the running costs of the school, selection of subjects, and extra murals (South African Schools Act of 1996).

¹⁰ Quintile rankings are obtained from the Department of Basic Education, figures are based on position of school in relation to surrounding infrastructure in order to determine how much funding the school receives (South African Schools Act of 1996)

Teacher A	3-year diploma	Level 6	5 years	English
Teacher M	Partial B.Ed. FP degree	Level 7	8 years	English
Teacher S	3-year diploma	Level 6	6 years	English

Additionally, it should be noted that, as recommended by Stetsenko (2020), there was explicit willingness expressed on the part of the Grade R teachers to participate and co-create new theory-informed praxis. This was achieved by setting up appointments with the principal of Windy Meadows before commencing the study, outlining the study's aims and objectives, and then providing time for the principal and teachers to consider the request before they responded with written permission. As such, the role of the researcher is to ensure that the appropriate environment nurtures collaborative practices and uncovers multiple realities (Rutgers & Reddy, 2013b). It is therefore essential that the researcher establishes the importance of this relationship of collaboration from the outset of the study, with the cover letter to the principal and teacher being of paramount importance (refer to Appendix B, C & D to view copies of the letters).

Additionally, special mention must be made to the secondary participants that formed an integral part of this study namely, the learners in each of the three Grade R classes. The study required the researcher to observe the nature of the activity, specifically by being immersed in the teaching and learning throughout the school day. This was necessary as mathematics in Grade R is integrated throughout the daily programme (DBEa, 2011a). Accordingly, the learners in each of the three classes were vital to the study, as without them, there would not have been a study. As secondary participants, they were not given any names and when referred to, were mentioned in the context of their specific class teacher, either Teacher A, Teacher M, or Teacher S.

4.5.4 Data Collection

Data collection in research refers to the systematic process of gathering and recording information to address the research questions and objectives (Bezuidenhout, 2014). This is essential to gather data that is both accurate and meaningful (Cohen et al., 2007).

Therefore, this study made use of direct and indirect observations, note-taking, sampling, video-recording, individual interviews and group discussions.

A remarkable feature of CHAT is its integrated approach that addresses whole systems; thus, this model can investigate the collective activity system from both practical and analytical perspectives by interpreting and understanding tensions (or imbalances) that occur within social settings.¹¹ Engeström (2011) elaborated how through using the framework of an activity system, data from fieldwork could be analysed and could offer meaningful insights into ethnographic studies. The latter studies describe the “ecology” of environments as a whole unit (including learners, teachers, class tasks, and resources) that collectively contribute to a dynamic system. Engeström’s research explains a formative process, starting with interviews, followed by observation, and then further follow-up interviews to provide scaffolding. The process demonstrates the interaction between these dynamic elements that results in either a stable or else a destabilised system. Key to the success of this research paradigm is the process of capturing all the variables (refer to Figure 4-1). This, Engeström explains, is achieved by paying strict attention to and capturing all aspects of the dynamic learning setting, as the methodology of this study endeavours to achieve (Engeström, 2011).

All data relating to this study was stored electronically (exclusively) using Microsoft Azure.¹² This is a database suitable for securely storing electronic data and access is password-controlled and was (and remains) only accessible to the researcher and her supervisor. This application has scheduled backups should any data accidentally be deleted.

4.5.4.1 Observation

As each classroom environment is unique and contextually situated, observation is an important tool used to understand classroom ecologies (Bezuidenhout, 2014). Observation plays a crucial role in qualitative research as it allows researchers to gather firsthand data about behaviours, interactions, and phenomena in natural settings (Cohen et al., 2018; Hesse-Biber & Leavy, 2011). Through observation, researchers can uncover rich, contextual details that might not be captured through other data collection methods,

¹¹ An example of a *possible* imbalance could be encouraging reading or doing number work yet using it as a form of punishment

¹² This is a Microsoft product offering safe and secure cloud storage with backup

such as interviews or surveys. Observation enables researchers to immerse themselves in the environment being studied, leading to deeper insights and a more nuanced understanding of the subject matter.

In this study, both direct and indirect observation were utilised to arrive at a full picture of the Grade R classroom ecologies at Windy Meadows. This process was informed and guided by the BERA standards guiding the ethical research protocol for each visit. This applied for the duration of the weekly observation cycles, totalling 40 hours of observation (BERA, 2018). This protocol is described in detail in the subsequent sections. The protocol includes a transparent discussion and acknowledgement of the impact of overt observation on the participants. The latter are aware that are being observed and could potentially be threatened by the presence of the researcher, causing participants to act differently (either consciously or subconsciously) (Hesse-Biber & Leavy, 2011). Importantly, during this time, it was important to slowly develop a process of trust and non-judgemental presence in the classroom to establish a good rapport with the three teachers to ensure the longevity of this study. This was achieved through positive affirmations, keeping interruptions to a minimum, and carefully constructed collaboration.

As indicated by Hesse-Biber and Leavy (2011), to maintain the authenticity and accuracy of the findings, the observations were recorded while the activities were underway. This involved taking notes, photographic sampling, and video recording.

Direct observation involves researchers directly observing and recording phenomena as they occur in real time, without intervening or influencing the situation. This method offers authenticity and immediacy, allowing researchers to capture natural behaviours and interactions without any filters or biases (Hesse-Biber & Leavy, 2011). This approach can include methods like video recordings, audio recordings, or analysing artefacts which allows for meticulous examination and coding of behaviours, gestures, and interactions. The approach enables researchers to deeply explore sociocultural nuances and complexities (Hedegaard & Fler, 2009).

In contrast, indirect observation involves the use of tools or technologies to gather data without direct interaction with the subjects. Vygotsky maintained that indirect observation is central to research in the field of psychology as it extends beyond

phenomena that can be directly observed (that of a positivist paradigm). Importantly, it extends to covert activity such as unconscious behaviour and developmental changes (Vygotsky, 1978).

4.5.4.2 Document Sampling

Photographs offer researchers a powerful tool for capturing the context in which teaching and learning occur. They can provide visual cues about the physical environment, classroom set-up, materials used, and learner interactions that might not be fully captured through written descriptions alone. Photographs can serve as a form of data validation and triangulation. They provide multiple perspectives on a given topic or phenomenon, allowing researchers to corroborate findings across different sources of data, thereby enhancing the credibility and reliability of the research findings (Cohen et al., 2018).

During the observation period, considerable time was spent in each of the Grade R classes, carefully observing the activities taking place and the extent to which they were occurring through play-based learning. As the observations progressed, pertinent aspects in specific learners' workbooks related to relevant numeracy-based activities were identified and photographed to support the observational findings.

In addition to this, photographic sampling was carried out for included activities observed, materials and, play-based equipment that were used, and worksheets and assessments that were completed. Hesse-Biber and Leavy (2011) maintain that using photographs strengthens the analysis by providing authentic evidence. In following BERA standards, special care was taken to ensure that the names of any samples were not visible and in instances where the learners were visible, their faces were blocked out to protect their identities (BERA, 2018).

4.5.4.3 Individual Semi-Structured Interviews

Individual interviews play a crucial role in sociocultural studies by providing a personalised and in-depth exploration of participants' experiences, perspectives, and cultural contexts. The individual interviews conducted with the three teachers for this study were guided by Luria (1996) and his thorough, probing approach to interviewing techniques. Luria advocated for the value of a clinical interview approach when conducting individual and small-group interviews. He recommended that interviews need to begin with broad and general questions before moving into specific and deep

questioning until answers emerge. At this point there is no doubt left – often referred to as “saturation point”. This approach supported the initial structure of the individual interviews and also provided a safe and supportive mode for approaching the subsequent focus group meetings. Broad-natured questions in the initial interview included asking the Grade R teachers to describe their paths to becoming teachers and to describe what they most and least liked about their professions. Later on, more specific questions were linked to actual instances that occurred in the classrooms such as how they handle the diverse languages that the learners bring and aspects relating to crime and gangsterism (refer to Appendix G for interview schedule outline).

These one-on-one interactions offer a unique opportunity for participants to express their thoughts and feelings in a private and confidential setting, facilitating a more nuanced understanding of their lived experiences (Hesse-Biber & Leavy, 2011).

Maxwell and Levitt (2023) describe how, through individual interviews, researchers explore intricate details of participants’ sociocultural backgrounds, and uncover subtle nuances and personal narratives that might be overshadowed in a group setting. They describe how the depth and richness of information obtained through individual interviews have the potential to contribute to a comprehensive analysis of the sociocultural phenomena under investigation, helping researchers to identify patterns, themes, and cultural intricacies that shape individuals’ perspectives within a broader social context. Thus, at Windy Meadows, the personalised nature of individual interviews was aimed at building rapport, trust, and insight into the lived experiences of the three teachers.

After observing the three classes for a period of eight sessions (two days in each class), the field notes, photographic samples, and audio and video recordings were analysed. This process was guided by the research questions and objectives of this study. This analysis was an important step in the process of initial analysis. After the aforementioned data was analysed, the broad-natured questions that guided the semi-structured interviews were compiled. Additionally, the researcher focused on the teachers telling their stories to arrive at an understanding of their backgrounds and how they influence their roles in the classroom. The researcher also asked about the support and coping mechanisms available to the teachers and enquired about their career aspirations.

The semi-structured interviews formed the second branch of the fieldwork and were conducted during break time in the Grade R classrooms when the learners were out to break (supervised by the other two teachers). These interviews were approximately 30 minutes long.

Motivated by the need to address the importance of understanding the historicity of each of the individuals (in alignment with CHAT), the three teachers were initially interviewed individually. This approach requires the researcher to position herself in a non-judgemental space where a rapport is developed with the subjects. Following this, the appropriate probing, in-depth questions can be posed, as demonstrated by Luria (1976) in his “clinical interview approach”. This approach advocates the strategy of using probing questions, thoughtfully delivered to “drill down” for meaning. The process is gently applied, beginning with broad questions of minimal intrusion and then, with time, moving to more specific, probing questions (refer to Appendix G). Of additional interest, Luria acknowledges the importance of inserting the double stimulation method into interviews to allow for the interrelatedness of everyday and scientific content to access abstract understandings in practical contexts.

When working in the CHAT framework, truth is constructed through a dialogue; valid knowledge ideologies emerge as conflicting interpretations and specific instances of activity are discussed and negotiated among the members of a community. In CHAT, researchers do not ask themselves “is this the truth?” Rather, they probe and speak about the issues raised during the interviews, the participants’ reactions, and the interpretations of these interwoven ideas. In this context, it becomes possible to open up the interpretive discussions – not for participants to confirm (or disconfirm) them – but to share our thinking and how the ideas might be used to change and address imbalances (Stetsenko, 2021).

4.5.4.4 Focus Group Meetings

A *focus group* in qualitative research is a data collection method that involves a structured and facilitated group discussion among a selected group of participants. The primary purpose of a focus group is to elicit in-depth insights, opinions, and experiences related to a specific research topic or questions (Hesse-Biber & Leavy, 2011). Aligning with CHAT principles, focus group meetings promote the interaction and exchange of ideas among participants. These often generate rich qualitative data, allowing researchers to

explore diverse perspectives, shared meanings, and social dynamics within the group (Sannino, 2008).

Sannino and Engeström (2018) explain how to co-create and collaborate with participants; researchers should understand the process as a study *with* participants – not *on* participants. They emphasise that to bring about improvement and change, participatory contributions are the key influences that drive changes and shift understanding.

In arriving at a deeper understanding of the activity system at Windy Meadows, focus group meetings were conducted to explore and comprehend sociocultural phenomena; rich and diverse insights were thereby gathered from the three teachers within a group setting. Through collaborative, open-ended discussions, the three teachers were encouraged to express their thoughts, experiences, and perceptions on the socio-culturally situated practices they engaged with at Windy Meadows. In doing so, the three teachers began to link their thinking and practice more concretely to the actual processes occurring in the classroom. In such a manner they evidenced the process of ascending from the abstract into the concrete as articulated in Chapter 3. The information gleaned from these focus group sessions played a pivotal role in unravelling the intricacies of the diverse context, providing a deeper understanding of the affordances of adopting a play-based approach to numeracy teaching to address the research question. Due to unforeseen delays as a result of school closure due to taxi strikes, there were some long gaps between focus group interviews which resulted in the three teachers needing to be reminded of previous discussions and points raised. This was done at the beginning of each session so as to provide them with the context and path for the meeting's discussion to follow.

Similarly, when planning for qualitative research in the education field, Hedegaard (2009) emphasises that, for qualitative empirical research to effect change, processes should be grounded in practical fieldwork, observing, and engaging with all role-players. Accordingly, and as proposed by Hedegaard (2016), when approaching developmental pedagogy utilising a qualitative approach, careful analysis of the implementation of the double stimulation is needed, specifically observing the degree to which there is constant interchange between every day and scientific knowledge of teaching and learning. This was achieved through encouraging participatory contributions from the three teachers to foster dialectical thinking with an overt understanding of the complex and contextually-

bound nature of human activity. It is argued that ultimately, through this process of discourse, practical experimentation occurs and this fosters changed ways of acting and thinking (Engeström & Sannino, 2021). This notion will be explored further in Chapter 5 in the data analysis section.

4.5.4.5 Audio Recordings

Audio recordings serve as the primary source for transcription in qualitative research; by transcribing audio recordings, researchers convert spoken language into written text, thereby facilitating data analysis and interpretation (Lichtman, 2023). Without audio recordings, researchers would rely solely on memory or notes that can be incomplete or subject to interpretation, whereas audio recordings capture the richness and complexity of human communication in its original form (Cohen et al., 2018). Audio recordings can preserve nuances such as tone of voice, emphasis, pauses, and non-verbal cues that may be lost or distorted in writing. Moreover, audio recordings provide an accurate record of research participants' responses and interactions. Unlike note-taking or memory recall, which can be prone to errors or biases, audio recordings offer a verbatim account of what was said during interviews, focus groups, or observations (Bogdan & Biklen, 1997). This accuracy is essential for maintaining the integrity and credibility of the research data (Lichtman, 2023).

Audio recordings utilised in this study enabled a detailed and fine-grained analysis of qualitative data from the activities, interviews, and meetings conducted at Windy Meadows. Additionally, the added feature of being able to repeatedly listen to recordings focusing on specific segments or moments of interest, and to identify patterns, themes, and nuances in participants' accounts helped arrive at an accurate account that was representative of the data set. Similar to procedures with the photographic sampling, consideration was paid to concealing any identifiable names associated with the recordings, and whenever the names were used, their pseudonyms were provided as alternatives. This maintained the gist of the conversation, but at the same time safeguarded the anonymity of all persons mentioned (BERA, 2018).

4.6 DATA ANALYSIS

The systematic process of analysing the data is described in this section. For individual and focus group interviews, the same process of analysis was applied (detailed further

below). This describes step by step the process whereby the data was notated, categorised, and analysed, which enabled themes and patterns to emerge. Additionally, the data analysis describes how the observations enhanced the analysis.

4.6.1 Transcription

Transcription is a fundamental process in qualitative research where spoken or recorded data, such as interviews, focus groups, or meetings, are converted into written text. This transformation allows researchers to analyse and interpret the data systematically (Cohen et al., 1993). In this study, all the interview recordings (both individual and focus group) were transcribed into written text. This step was crucial for making the data accessible and manageable for analysis. This task was deliberately performed alone by the researcher. As argued by Cohen et al. (2007), when the researcher works in this way, they connect with the written text and the content becomes familiar; subsequently, the overall context becomes clearer and central themes and ideas begin to surface (Maxwell, 2021a).

The contradictions that emerged from this transcription of recorded observations and interviews were analysed with the help of the aforementioned thematic analysis, and these informed the basic structure and nature of each subsequent interview process with the Grade R teachers. This is in line with developmental didactics where analysis forms an integral part of qualitative studies (Cohen et al., 2007), and this stage formed part of the preliminary analysis. Additionally – and strongly tied with sociocultural research within the CHAT framework – the analysis should also look at the motives of the participants within the activity system. This also needs to be constantly acknowledged and included in the thematic analysis of the study (Cole & Engeström, 1993)

As insights emerged, this thematic approach was essential in that it provided structure to the findings. The analysis involved identifying and labelling specific concepts, phrases, or ideas in the text. Inductive reasoning was also used to generate initial findings without imposing preconceived categories (Hesse-Biber & Leavy, 2011). Initial theme headings were generated by extracting meaningful segments of text and assigning descriptive narratives to represent the content. These narratives captured the essence of what was being said by the three teachers in the interviews. Over time, by looking for similarities and differences in the teachers' responses, there was the opportunity for comparison and

contrast across different interview transcripts. This process helped in identifying patterns and additional themes that cut across multiple interviews.

Importantly, as outlined by Maxwell and Levitt (2023), textual analysis that analyses the language by looking for linguistic clues allows insights into the cultural, social, and historical factors to emerge. In the current study, such analysis involved looking for specific words, phrases, or expressions that indicated commonalities or variations in participants' experiences, attitudes, or perspectives. This process also aligns with the CHAT paradigm which supports the notion that language provides meaning and insight into practices.

Subsequently, the process was repeated and refined so that connections could be established between the different themes; to organise and structure the analysis, new findings were constantly comparing and contrasting with existing ones. Hesse-Biber and Leavy (2011) explain how this iterative process helps refine and develop the thematic framework as more data is analysed. In the current study, this assisted with identifying overarching themes which, in turn, addressed the research question. The broader concepts emerged from the coded data in the form of themes that captured the essence of what participants were expressing (Ryan, 2006).

4.6.2 Thematic Analysis

Sociocultural models recognise the complexity of human behaviour and social interactions. The use of thematic analysis provides a flexible approach to capturing this complexity by allowing researchers to explore multiple themes and their interconnections. It enables the examination of nuanced patterns, contradictions, and tensions within social phenomena (Maxwell, 2021b).

As described in the aforementioned section, through the process of iteration, the ideas emerging from the analysis were structured and gradually organised into themes. In part, this meant a review of the coded data and themes to ensure that they accurately represented the three Grade R teachers' experiences and perspectives. This involved reading and re-reading transcripts and field notes, and scrutinising photographic evidence to become more familiar with the content. The methods described here align with the interpretative analytic approach that seeks to make sense of truth and reality and uncover beliefs and covert meaning. This is described by many scholars as the *hermeneutic*

approach where analysis uncovers obscured realities (Bezuidenhout, 2014; Engeström & Sannino, 2011).

Once the themes were identified, they were reviewed and refined, including by cross-referencing to the activity system where tensions appeared (when there were gaps where no data was linked to a specific component of the activity system). This process supported examining the coherence and relevance of each theme inherent in the dataset and research questions. Cross-referencing data across different components of the system helps to ensure that data is analysed in relation to its context and that connections between different aspects of the activity system are taken into account (Creswell & Poth, 2016). Through this process, the observations and data from the interviews were organised within the context of the broader activity system (including its various components such as subjects, tools, rules, and division of labour). Consideration was also given to how the themes intersected with each other, given the three Grade R teachers' contexts and similar struggles. Once each theme had been defined, it was assigned a title to accurately capture its essence. With the tentatively finalised themes in place, the process of writing up the analysis began. This involves presenting the themes in a cohesive narrative sequence along with supporting evidence from the data, such as quotes and photographic items as examples (Hesse-Biber & Leavy, 2011).

The narratives emerging under each theme served to illustrate how the teachers actively and (sometimes unconsciously) engaged with certain discourses and how they were interactively positioned and influenced by other people, past experiences, social structures, and discursive practices. As demonstrated by Ryan (2006), narratives have the potential to provide insight into the dynamic relationship between personal agency and the broader social and cultural contexts in which individuals navigate and interpret their lives. Social structures and phenomena are experienced and understood through individual subjectivity and are often articulated most effectively through narratives.

4.7 TRUSTWORTHINESS

Trustworthiness in educational research is crucial for ensuring the validity and reliability of findings. Researchers need to adhere to ethical standards and employ rigorous methodologies to build trust in their work. There are four recognised processes

contributing to the trustworthiness of educational research, namely credibility, transferability, dependability, and confirmability (Cohen et al., 2018).

Credibility refers to the authenticity and plausibility of the research finding and is established through rigorous data collection and analysis methods, as well as the use of triangulation. Dependability relates to the stability and consistency of the research findings over time whereas confirmability refers to the objectivity and neutrality of the findings, ensuring that they are not unduly influenced by the researcher's biases or preconceptions (Cohen et al., 2018). Transferability refers to the extent to which the findings of the research can be applied or generalised to other contexts or settings.

4.7.1 Credibility

This was achieved through detailed and regular observations, notes, and audio recordings, and through providing supportive documents, photographs and videos. This is a crucial aspect of working within the sociocultural and historical framework of CHAT. Vital to this study, in answering the research question, is the commitment to ensure that the findings accurately represent the unit of analysis. This was achieved for the present study through systematic planning and consultation at every phase with the relevant stakeholders. This also involved constant reflexive analysis to ensure that the researcher remained aware of personal bias and avoided assumptions. The rigorous attention to the unit of analysis by the researcher, informed by the literature and strong data collection over an extensive period, provided a solid foundation for trust in the study's findings. The research plan supported this process by ensuring reliable findings based on the extensive time spent at Windy Meadows that provided longevity to the findings.

4.7.2 Dependability

Dependability in qualitative research ensures the dependability and stability of both the research process and research findings throughout a study. Bogdan and Biklen (1997) describe how this can be achieved by keeping transparent documentation of all research procedures (including all data collection, analysis, and summaries). Additionally, Hesse-Biber and Leavy (2011) maintain that dependability is achieved through adherence to established qualitative research standards and the observance of guidelines; this is seen as vital to maintaining consistency and reliability throughout the study. Furthermore, they add that researchers enhance the credibility and dependability of their findings by

triangulating data from various sources or employing multiple methods (such as interviews, observations, and document analysis).

To enhance dependability, researchers should provide detailed descriptions of the research methods, participants, and context, allowing readers to assess the relevance of the findings to their contexts (Bogdan & Biklen, 1997). In the context of the present study, this included elaborating on participant and research site selection, providing thorough background information on participants and research sites, describing data collection methodologies, and offering a thorough explanation of the data analysis process.

Guided by the activity system, CHAT encourages iterative analysis, where data analysis is an ongoing process that evolves. In the present study, by continuously revisiting and refining analysis within the activity system framework, the dependability of findings was strengthened.

4.7.3 Transferability

Lichtman (2023) describes how with quantitative research, transferability refers to the extent to which the findings and conclusions of a study conducted in one context can be applied or generalised to another context. It involves assessing whether the results obtained in a specific research setting can be relevant and applicable to other similar settings or populations. It involves considering factors such as the characteristics of the sample, the research methods employed, and the context in which the study was conducted to evaluate the potential for transferring the results to other contexts or populations.

CHAT underscores the uniqueness of activity systems. The epistemological basis of CHAT views knowledge to be constructed through interactions in specific sociocultural contexts. Thus, the findings from an activity system cannot be generalised. In fact, it has been argued that one of the strengths of CHAT is the non-transferability of findings as this highlights the importance of context in understanding human activity (Stetsenko, 2021). However, the application of CHAT in different settings contributes to the development of methodologies that can be adapted and refined for use in other research contexts such as the types of questions to ask, and the analytical techniques can be generalised to enhance research in other fields (Maxwell & Levitt, 2023; Stetsenko, 2021).

CHAT is characterised by its context-specific nature, which inherently involves the researcher as an active participant in the process of meaning construction rather than simply finding pre-existing meanings. The theory's emphasis on the significance of historical and cultural contexts makes interpretation inherently subjective, as different researchers might highlight differing contextual aspects, based on their perspectives. Researchers are not detached observers but active participants who co-construct meaning with participants, influenced by their theoretical tools and conceptual lenses (Vianna & STETSENKO, 2014). The dynamic and evolving nature of activities requires subjective interpretation that adapts to temporal changes, with researchers identifying and interpreting contradictions within activity systems based on their judgements. Aligning with constructivist epistemology, CHAT asserts that knowledge is constructed rather than discovered, with researchers shaping research outcomes through immersive and participatory observation. This praxis-oriented approach integrates theory and practice, requiring researchers to navigate the subjective interplay between theoretical insights and practical interventions, aiming for transformative outcomes through co-constructed meanings and understandings that are contextually relevant and actionable (Foot, 2001).

4.8 ETHICAL CONSIDERATIONS

As outlined by (2018), educational researchers should prioritise maintaining the integrity and reputation of educational research by conducting their studies to the highest standards. To foster improvement in practice and the advancement of knowledge, these researchers should actively participate in critical analysis and constructive criticism. Accordingly, for the present study, written approval was obtained from all stakeholders to ensure that no person was in any way negatively impacted by this study, either directly or indirectly (Bezuidenhout et al., 2014). Some important aspects relating to ethics are the need to provide all participants with transparent information, an outline of the entire process, and importantly, assurance of their anonymity and confidentiality and to ensure that this assurance is upheld. It is also necessary to obtain informed consent from all participants (Cohen et al., 2007).

4.8.1 Ethical Clearance

This process commenced with obtaining ethical clearance from the University of Pretoria's Early Childhood Research Ethics Committee. Part of this process included

developing of a summary of the approved proposal and covering letters (including the one for the WCED and schools). Details regarding the nature of the research fieldwork, and procedures relating to the research such as timing and duration were outlined. Further details provided included the research questions, objectives, methods, potential risks, and benefits. This proposal served as the foundation for the ethics review process. On 28 March 2022, ethical clearance was granted for three years under the ethics protocol number EDU201/21. Following this approval, and as per requirements for research to be conducted in schools, the ethics application was sent to the Western Cape Education Department. The reference application was granted and was allocated the protocol number 20220517-2210. This application was further extended until March 2024 with a research protocol reference number 16375E04C00006E-20230427. Once these applications were granted, the field research process commenced (refer to Appendix G).

4.8.2 Informed Consent

Informed consent is the process through which participants are provided with relevant information about the research and voluntarily agree to participate. This entails ensuring that participants are aware of how their information will be handled, stored, and used, thereby contributing to transparent and ethically sound research practices (Bezuidenhout, 2014).

For the present study, the principal and Grade R teachers were approached with all the approvals for final informed consent. This was vitally important, as the principals and teachers bear the responsibility of *loco parentis*, that is, being legally responsible for the learners within the various school communities according to the fundamental children's rights in the Constitution of South Africa, 1996. Furthermore, in South Africa, any research involving children is governed by the norms and laws as set out in the NHA, which stipulates mandatory parental or legal guardian consent for all children under the age of 18 years (National Health Act, 2004). The information provided to all parties approving the research needed to show that there was minimal risk to the learners and that all participants' identities were protected (refer to Appendices D and E). Details such as the assurance of not revealing the learners' names, faces, or identities were explicitly mentioned following fundamental ethical principles underpinning educational research (Hammersley & Trainou, 2012). Additionally, the letters contained the standard clauses stipulated by (BERA, 2018), namely, password protection for data, being allowed to ask

questions or raise concerns at any stage of the process, and requesting permission to use the data for possible further research (in a way that maintains confidentiality and anonymously).

Additionally, the learners were required to fill out an assent form (refer to Appendix F). An assent form is a document used in research, particularly involving minors or individuals who may lack the capacity to fully understand the research process. It is designed to provide these individuals with simplified information about the study in a way that is appropriate for their age and cognitive level. Assent forms typically explain the purpose of the research, what participation entails, any potential risks or benefits, and the voluntary nature of participation (Hesse-Biber & Leavy, 2011).

4.8.3 The Role of the Researcher

In sociocultural studies, it is recommended that the researcher comes to an understanding of his or her own epistemological stance on the study. Ryan (2006) argues that insights about the limitations of positivism have the potential to highlight how important social-cultural studies are. Ryan maintains that as a researcher, you have to understand your own place in the world and what you are bringing to the research by way of assumptions about knowledge. A vital part of social-cultural studies is the need to investigate how your epistemologies support your understanding of your assumptions and the way these affect you as a researcher. In a sociocultural study, the researcher must arrive at an understanding of how people construct and maintain their perceptions of the world. Examining your epistemology involves looking at the underlying assumptions you use to make sense of your lived reality.

Social-cultural studies assert the value of ethics, justice, and the influence of politics in research (Stetsenko, 2021). Research in this manner requires an ability to see the whole picture, an overview or a distanced view. In that sense, there is a level of objectivity. However, it is vital to note that the researcher's findings are always context-specific and therefore a researcher requires patience, persistence, empathy, and self-discipline, among other traits. Most importantly, one needs to constantly question one's own assumptions and internal dialogue.

In the context of educational research, on a practical level the “Hawthorne effect” can manifest when learners or teachers modify their behaviour or performance owing to their

awareness of being observed or studied (Sedgwick & Greenwood, 2015). Individuals may alter their actions to conform to what they perceive as socially desirable or expected. This can result in participants providing responses or engaging in activities that they believe will be viewed positively by researchers. This effect was first noticed and named after a series of studies conducted at the Western Electric Hawthorne Works in Chicago during the 1920s and 1930s. To mitigate the associated concerns of the Hawthorne effect, the observations in this study were conducted over an extensive time frame. As indicated in the research plan, this was done to ensure that participants became accustomed to the presence of a researcher. This reduced the impact of the initial awareness whereby participants would potentially have acted differently as they became aware that they were being studied (Sedgwick & Greenwood, 2015). Throughout the research process, the researcher maintains ethical standards, ensuring the confidentiality and anonymity of participants, obtaining informed consent, and minimising any potential harm or discomfort (Hesse-Biber & Leavy, 2011).

4.8.4 Anonymity and Confidentiality

Historically, Schoenfeld (1999a) explains that there is evidence of teachers being criticised by people being allowed into their classroom settings and resultantly, are often reluctant to expose themselves as part of the selection process. Therefore it will be vital to assure participants of their anonymity and explain how their willingness to participate in this study is something to be valued and supported (Schoenfeld, 1999b). To protect the privacy and well-being of all participants, anonymity and confidentiality are critical considerations in educational research. Anonymity refers to ensuring that the identity of the participants remains unknown and also pertains to the information relating to the research site and data, ensuring that there is no link with the participants (BERA, 2018).

According to Bezuidenhout (2014), anonymity encourages honest and open responses from participants, as they feel reassured that their identity will not be disclosed. This is particularly important in sensitive educational topics or unstable activity systems. Confidentiality builds trust between researchers and participants, encouraging individuals to share information openly (Schoenfeld, 1999a).

4.9 CONCLUSION

Chapter 4 covered the study research design and methodology, tailored to the objectives provided in Chapter 1. It delineated the adoption of an ethnographic approach, coupled with exploratory techniques within a qualitative paradigm. Rooted in activity theory, the theoretical framework was introduced as a vehicle for fostering transformative analysis and subsequent shifts for this study. The research paradigm of interpretivism was outlined, prioritising the attainment of deep understanding amid the recognition of multiple realities within the Grade R context.

Central to this chapter was the explanation of the distinctive attributes integral to CHAT. Noteworthy among these is the model's iterative and formative nature, facilitating continuous refinement and collaboration with participants. The description of the research plan showed how this unfolded across five planned phases, affording space for theory–praxis cycles, analysis, and reflective iterations. The way that each phase of the study was structured was explained, featuring specific timelines of activities. Moreover, the chapter described sampling strategies and explained the rationale behind purposive sampling methodology. Specifically, three Grade R classes from Windy Meadows Primary School were purposively selected, ensuring a diverse yet manageable sample pool. Participants encompassed not only the Grade R teachers but also the learners within each class, capturing a holistic view of the setting. In terms of data collection methods, the chapter elaborated on the techniques employed, including direct and indirect observations, interviews, photographic sampling, video recordings of classroom activities, and focus group interviews. By grounding abstract concepts in concrete, observable events, it was possible to systematically collect and analyse data. This process involved looking at how these elements interact and influence each other within the activity system.

In essence, Chapter 4 furnished a thorough blueprint of the research design and methodology. It underscored the foundational principles underpinning the CHAT framework while explaining the intricate details of the research plan. The prioritisation of CHAT principles in data collection and analysis underscored the importance of methodological rigour.

CHAPTER 5

DATA ANALYSIS

5.1 INTRODUCTION

The previous chapter described the research methodology used for this study, drawing attention to the strong links to the theoretical framework of CHAT. This chapter provides an in-depth analysis of the gathered data to ascertain its relevance to the research question. The analysis explores the potential efficacy of a sociocultural model of play-based pedagogy in the context of teaching emergent mathematics in South Africa's reception year classrooms. More specifically, a comprehensive examination is undertaken of the culturally situated teaching practices of three Grade R teachers at Windy Meadows. Employing a qualitative approach, the analysis seeks to offer insights into the facilitation of play-based model learning and skills supported by CHAT that frames and supports analysis.

Guided by the theoretical underpinnings of CHAT, the data from interviews, observations, and document analysis, uncovers the underlying comprehensions, meanings, and tensions of the Grade R classroom activity system(s) at the selected school. The analysis encompasses both the individual and collective experiences of the three Grade R teachers in the diverse sociocultural setting at Windy Meadows. The justification for this mode of analysis aligns with CHAT, whereby sociocultural theories describe how individual experiences are unique and are always historically and culturally situated (Cole & Engeström, 1993).

These experiences take on new meaning when the individuals act as a collective (Daniels, 1996). Additionally, sociocultural theories emphasise the dynamic interplay between individual and collective experiences. These theories recognise the crucial role of social interactions, cultural contexts, and shared experiences in shaping human development, cognition, identity, and societal structures. Understanding these dynamics is essential for comprehending how individuals navigate and contribute to their sociocultural environment (Gindis, 1999; Moll, 2004).

In addressing the research question, the analysis is structured into three overarching themes which provide the arrangement for this chapter. Each theme serves as a lens through which the practices are revealed, with the identified manifestations of

contradictions acting as catalysts for change (Engeström & Sannino, 2011; Foot, 2014). Maxwell (2021a); (Maxwell & Levitt, 2023) detail the importance of utilising a thematic approach with qualitative research, demonstrating how, by capturing initial themes (also referred to as narratives) patterns begin to emerge in the data. When subsequent data is brought to the fore, this data either adds strength to the findings or is re-examined or discarded until one can arrive at generalised themes relating to the observed and recorded phenomenon.

After multiple iterations of data analysis, three themes emerged in this study; these provide potential and actual insight into teaching and learning practices and their alignment with play-based pedagogy within the diverse setting at Windy Meadows. The themes highlight the positive aspects of play-based pedagogy and examine how these practices could be further developed, supported and informed by CHAT. The themes provide insight into discursive manifestations of contradictions, revealed through linguistic clues embedded within the practices and expressed views of Grade R teachers. These manifestations encompass a broad range of ideas, opinions, and experiences shared by the teachers over an extensive research period of 18 months. They include dilemmas, conflicts, and double binds that are carefully examined within the framework of three distinct themes and several sub-themes.

Theme 1 focuses on cultivating inclusive emergent mathematics through play and explores the teachers' approaches to planning and implementing emergent mathematics instruction, as well as their attitudes towards diversity in the classroom. Specifically, it examines how the three teachers participating in the study facilitate emergent mathematics learning for Grade R learners from diverse sociocultural backgrounds. The theme addresses the research question by examining the details of how the teachers plan, manage, and execute instructional activities. Additionally, the analysis assesses the teachers' ability to effectively incorporate mathematical concepts to promote emergent mathematics skills among their learners, highlighting the importance of engaging all learners, especially those from socio-economically challenged backgrounds and where English is a second or third language.

To accomplish this, examples of specific instances are used to illustrate how these practices are implemented in the classroom. Subsequently, CHAT is utilised to analyse the planning practices, beliefs, and values of the three teachers within the activity system

as a unit of analysis. The aim is to evaluate the teachers' capacity and readiness to effectively facilitate play-based mathematics teaching, offering valuable insights into the practical application of CHAT principles in the context of emergent mathematics instruction for diverse learners. The CHAT analytical framework considers individual experiences and histories, foregrounded by the influence of social contexts and the established rules within communities of practice. This is in line with the description provided in numerous studies that consider the role of CHAT in understanding the often illusive influence of play on learning in the early years (Daniels, 1996; Hedegaard, 2009; Leong, 2023; Van Oers, 2013).

Theme 2 dealing with navigating play-based emergent mathematics amid constraints, examines the challenges teachers face while implementing play-based emergent mathematics approaches. These challenges include pressure owing to excessive assessment requirements and a lack of support, highlighting the importance of balancing creative, inclusive learning experiences while addressing these constraints. Theme 2 also explores the culturally situated challenges encountered by Grade R teachers in teaching mathematics to diverse learners, addressing specific hurdles including lack of inclusivity in instructing in a first additional language. The theme also probes constraints related to the nature of assessments and explores the structural challenges stemming from historical socio-economic hardships; these socio-economic difficulties have persisted even after South Africa's transition to democracy, particularly regarding the marginalisation of migrant learners and the impact of a scarcity of resources.

To unpack these challenges, the analysis uncovers manifestations of primary, secondary, and tertiary contradictions, as outlined in Chapter 4. Primary contradictions represent inherent tensions within a specific activity system. At Windy Meadows, the primary contradiction arises from the tension between fulfilling curriculum-prescribed assessment procedures and actively promoting play-based learning. Secondary contradictions emerge from attempts to resolve primary contradictions, such as allowing free play only after completing formal tasks, during which learners are permitted to use their home language. Tertiary contradictions involve conflicts at a higher level, often linked to the broader societal and institutional context. At Windy Meadows, activities in the daily programme prioritise English language dominance, undermining the diversity in the classroom and undervaluing other languages and associated sociocultural influences.

Theme 3 marks a shift in the analysis to focus on the teachers' openness to the proposed play-based model. and specifically, the data emerging from feedback during the focus group meetings. This includes both individual and collective responses and the unpacking of subtle yet powerful shifts in their modes of thinking about their teaching practices. Key findings that the data brings forth include more self-awareness of their roles in shaping each learner's pathway. Stemming from the improved self-awareness, the analysis includes the teachers' proactive changes supported by practical solutions to addressing assessment constraints. In doing so the analysis shows a shift where, learning through play and assessment become one. Through this process, there is a gradual breakdown of abstract findings, capturing the transformation in the translation of theoretical concepts into more tangible, practical activities. In doing so, this intricate process explores how the teachers mobilised educational theory in a manner where this theory is concretely applied in the classroom setting, providing a plausible model for supporting and encouraging ongoing improvement in teaching and learning (Hedegaard, 2020).

A central focus within this analysis is the unravelling of the logistical constraints inherent in the teachers' experimentation with alternatives. This includes a detailed examination of the challenges, uncertainties, and adaptive strategies that emerged as the teachers struggled with integrating new approaches into their existing practices. By scrutinising the teachers' responses and the developing dynamics within the focus group meetings, Theme 3 provides a narrative of cognitive shifts and practical adaptations taking place among the teachers as they engage with and internalise the proposed play-based model.

The exploration of play-based, inclusive teaching to diverse learners within each of the three themes not only sheds light on the challenges faced by the teachers, but also catalyses questioning the status quo of their existing practices. Moreover, by addressing these discursive elements, CHAT plays a transformative role in instigating a drive for change, prompting a re-evaluation of current approaches to teaching emergent mathematics in culturally and linguistically diverse classrooms. In doing so, this chapter addresses the research question and offers possible solutions to the viability of a social and culturally responsive model of play-based pedagogy in Grade R in South African classrooms.

5.2 THEME 1: CULTIVATING EMERGENT MATHEMATICS THROUGH PLAY

In this theme, the object of analysis is the three Grade R teachers. The analysis considers each teacher, both as an individual and as an integral part of the collective consisting of the three teachers. Additionally, it explores the teacher's relationship with the learners who have transitioned into an unfamiliar learning environment characterised by new sociocultural practices and rules governing their activities.

To address the research question, this theme probes the routine occurrences in the classroom. It investigates how teachers perceive and interact with mathematical concepts, thereby revealing the nature of the activities and the extent to which they are carried out through the medium of play. Moreover, the analysis scrutinises how learners react to their new and highly diverse environment during this initial phase of transitioning into formal schooling.

5.2.1 Teachers' Planning for Emergent Mathematics

Each of the teacher's training, skills, experience, and history emerged during the months of observation and the individual teacher interviews. This background provided insight into how each teacher's past experiences shape and impact the nature of teaching and learning taking place. In answering the research question, analysis in terms of this sub-theme related to the three teachers' daily planning for the teaching of emergent mathematics. The analysis highlighted the potential conflict arising from how this planning is conducted.

The three Grade R teachers followed a set daily plan that details exactly what activities occur throughout the day. Their planning was guided by the Grade R activity guide, designed to be used in conjunction with CAPS including suggested activities for teachers to incorporate into their daily programmes (DBEc, 2015). This guide is provided to teachers based on the need for Grade R teachers to receive better support owing to the lack of suitably qualified Grade R teachers in many schools throughout the country. In addition to poor training, many of these teachers face contextual challenges (Ashley-Cooper et al., 2019).

In her interview, Teacher M took pride in describing her initiative to construct the weekly and daily plan for all three classes, drawing from the aforementioned prescribed planning

guide. She insisted that by having this in place, she was saving all three teachers a lot of time as there was then no need to give this input every morning when things were busy. Thus, for every day and every week, the content covered was identical in all three Grade R classes. Teacher M, in her interview, indicated that planning was her strength and that if she did not complete her daily goals related to teaching as planned, she would ensure that she caught this up the following day. She added that teachers in the other grades could learn from them and how they work as a team. She explained that CAPS provided concepts that they took and prepared their lessons around.

In the context of activity theory, Vygotsky wrote extensively on the occurrence and implications of rules in regulating activity, and how these rules contribute to a shared understanding of how things are done (Daniels, 1994). Similarly, as described by Engeström (2000), tacit rules play a crucial role within an activity system and can potentially give rise to conflicts. Tacit rules are implicit norms, values, and expectations that guide the behaviour of individuals within a particular community or system. These unspoken guidelines shape the way participants understand and approach their activities. Conflicts emerge when individuals hold divergent interpretations of these tacit rules, leading to misunderstandings or clashes in their actions. The implicit nature of these rules can make them challenging to identify and address, requiring a deeper exploration of the underlying assumptions and perspectives within the activity system. In CHAT, it is important to uncover and make explicit such tacit rules to foster better communication and collaboration, thereby mitigating potential conflicts within the activity system.

The CHAT framework provides a lens for examining how hierarchical structures influence the assumption of authority roles within an activity system. At Windy Meadows, an apparent incongruity arises when observing that the unqualified teacher holds the lead position in decision-making and planning. This unconventional arrangement hints at a tacit rule within the system, where experience of a Grade R teacher has more sway than their formal qualification. On closer examination, it was also revealed that Teacher M had likely adopted this role to pre-empt interruptions from other teachers seeking guidance on daily content. Despite the completion of qualifications by the other two teachers, a lack of confidence on their part appeared to hinder their autonomy, perpetuating a reliance on Teacher M for daily planning and decision-making. This specific dynamic highlights the tension and misalignment within the activity system,

shedding light on how hierarchical structures impact authority and decision-making processes (refer to Figure 5.1).

Bodrova and Leong (2019), drawing on the writings of Elkonin (1978), describe how planning is a well-established key feature in children's play, whereby children engage in extensive discussions about who will take on which roles and how these are followed by brief periods of enactment. In a similar vein, Leong and Bodrova (2012) argue that the teacher can plan and initiate the process by enquiring about the children's preferences for play or desired roles, prompting them to engage in discussions with their peers regarding role choices. Subsequently, teachers can guide children in exploring more specific details of their planned play scenarios, including the identification of possible emergent mathematics concepts to be awakened through their conversations and exhibited interests in play.

It could thus be inferred that the teachers at Windy Meadows needed to consider how they could draw more directly on their learners' situated play interests, supported by their policy guides, to inform their planning; in such a manner, they could transform their practice of planning into a more contextually responsive approach. Thus, through this process, the preparation for emergent mathematics could encompass the establishment of mutually agreed-upon rules of engagement, collectively determined tools for learning, and negotiated roles. This approach aligns with the active and dynamic interaction within the CHAT framework.

5.2.2 Facilitating Emergent Mathematics Through Play

In this sub-theme, the analysis describes the adherence to scripted lessons and the occurrence of rote learning, the impact of planning tools on the nature of the classroom context, and the teachers' conceptions of the term "concrete". Drawing on actual examples of verbal exchanges, with the support of CHAT to analyse the data, this section addresses the research question by providing insight grounded in theoretical understanding, specifically drawing on the role of mediation and the scaffolding of learners.

The Grade R teachers at Windy Meadows meticulously followed the prescribed content from the activity guide, resulting in lessons that were highly scripted. Morning rings involved rote recitation of dates, months, and mathematical terms, raising concerns about

meaningful engagement and conceptual understanding. For example, it was frequently observed that the learners, together with their teachers, spoke in a rote manner, for example, when daily reciting the months of the year: “There are 12 months in a year” – repeated twice, raised questions over whether the learners know 12 as a concept abstractly. Similarly, in morning emergent mathematics rings in Teacher S’s class, the date was said as routine with the learners joining her recital: “Two thousand and twenty-two.” The routine also included regular call-and-response emergent mathematics and life skills-related activities integrated into the morning. The learners were often observed to be repeating sentences and phrases in a somewhat mechanical manner, guided by the teacher’s instructions:

Class and Teacher S: Today is partially cloudy.

Teacher S: Repeat

Class and Teacher S: Today is partially cloudy.

Given that the number range, symbols, and words prescribed for Grade R is 0–9, it seemed to be a meaningless exercise of rote chanting popular in the days of apartheid and “Bantu education”¹³, where large classes were the norm, and in these overcrowded circumstances, critical thinking was discouraged (Hoadley, 2017; Kallaway, 2002; Prinsloo & Stein, 2004). Vygotsky cautioned against superficial interpretations of imitation, (rote learning) emphasising the need for meaningful dialogue and modelling in the creation of knowledge (Vygotsky, 1962). Similarly, in more recent literature, the sentiments are echoed by Mason and Johnson-Wilder (2004) who emphasise accurate modelling as a vital pedagogic tool for conceptual understanding. In a similar vein, Hedegaard’s exploration of the ZPD highlights the role of play and social contexts in mediating learning authentically (Hedegaard, 2009).

Hedegaard (2009, p. 64) insists that any learners’ development is anchored in societal values, which institutions, namely schools, prioritise. Consequently, she emphasises that “a diversity of traditions and values for a good life” are central when adopting a cultural-historical approach to conceptualising and promoting children’s development. Similarly,

¹³ The Bantu Education Act of 1954 controlled educational outcomes under the regime of apartheid, whereby the nature and structure of black education was controlled to exploit the marginalised.

Bodrova and Leong (2019) also emphasise the social influence on learning and suggest that speech often assumes an underestimated role in play-based learning. Drawing on the work of Vygotsky, Stetsenko and Ho (2015b) describe how, through play, children can exercise freedom and actively shape their understanding of the world, and in doing so, resist top-down processes where individual choices are limited and passive. Stetsenko and Ho describe play as agentive and self-determined and not directed by the dictates of objects and instances. These notions of play clash with the scripted and structured nature of the observed lessons.

It was observed during the field work at Windy Meadows school that concrete materials were extensively used, connecting everyday items to the curriculum, but with limited choice to suit diverse learner contexts. Each morning, pre-set tables were organised into four heterogeneous groups with three tables and six learners each to facilitate interactive and peer-guided learning. Activities in the first group of learners included number modelling with play dough mats, creating numerals, and shaping them around templates.

The second group of learners focused on numeral copying, number name writing, and creating corresponding icons. The third group engaged in a game, for example, using dice and unifix blocks, demonstrating the integration of discrete counting and continuous measurement. However, learners prioritised building their towers quickly, overlooking the value indicated on the dice. This learner-led approach was discussed in subsequent meetings to find ways for teachers to support the learners while allowing them autonomy (refer to Figure 5.1). The fourth group involved a cut-and-paste exercise, enhancing fine motor skills and reinforcing one-to-one correspondence in counting.

This daily format was repeated throughout the week, with Fridays reserved for the assessment of the concepts covered in the week. It should be noted that the third group (the free-play station) was the only group that was not guided by the teacher at any stage other than to regulate the noise levels.



Figure 5.1: Free Play with Unifix

The three teachers frequently used the term “concrete” in discussions about engaging learners in mathematical concepts, often equating this term with “hands-on” or “creative tasks”. Yet, the teachers spent a significant part of the morning guiding learners through worksheets as practice attempts for assessment Fridays with little sign of room being left for creativity and active learning. In contrast, it was evident that, when engaged in free play, the learners frequently demonstrated their grasp of numerical concepts. An illustrative dialogue between two learners during free play exemplifies this:

Learner 1: Let’s make cars.

Learner 2: Let's make six and ... and one Come, take this car, I'm coming now.

Learner 1: I'm making, uh, four ...

Learner 2: Number one!

Learner 1: Number two.

During whole-class activities, the teachers incorporated relatable items into their lessons, thereby utilising the double move – infusing spontaneous, everyday knowledge with scientific understanding (Hedegaard, 2020). One lesson example included utilising two-litre soft drink bottles to reinforce quantity. The bottles represented quantity concretely in the form of water and in iconic form with dots denoting the value (refer to Figure 5.2).



Figure 5.2: Discrete and Continuous Measurement

However, these items were introduced to learners with limited opportunities for exploration and self-determined meaning-making – such as through active exploration,

estimating, judging, making errors, and self-regulation. However, if these opportunities are available, learners acquire vital skills needed for establishing a strong number concept (Gallistel & Gelman, 1986).

Engeström et al. (1996), elaborate on Vygotsky's concept of cultural mediation, describing how tools and artefacts are intertwined with human activity and in doing so, highlight the significance of tools in influencing understanding, meaning-making, and the dynamics of human activity. The analysis of the reliance on worksheets and limited use of the bottles suggests a paradox arising: namely, the tools that are meant to guide and support teachers may inadvertently limit active learning and play-based pedagogy.

Conversely, during the analysis of free play, particularly in the context of block play, learners exhibited their grasp of numerical concepts. This occurrence potentially offers an optimal opportunity for teachers to engage in discourse and guide the learners' play-based learning experiences. This is exemplified in the writings of Van Oers (2013) as his research shows how, by using the CHAT perspective, teachers can join in on play. This is achieved through their understanding of the CHAT framework, where rules, roles, and artefacts are negotiated and adjusted contextually. In doing so, this could potentially close the gap in research that exists regarding the uncertain role that adults assume in play-based learning.

Exemplifying Vygotsky's notion of the ZPD, Daniels (1996) describes how scientific knowledge can be introduced and directed to scaffolded learners, allowing them to move beyond their current understanding. This is a vital aspect underpinning development within the ZPD, as it offers a more organised and structured framework for grasping complex concepts (Hedegaard & Flear, 2009). Through the use of tools, there is potential to mediate and transform goals and actions. The introduction of a new tool can change the nature of an activity, making it more efficient or altering the goals individuals pursue. The analysis suggests that the teachers' grasp of the concept of "concrete" fell short in establishing a connection between the term "concrete" and the symbolic understanding and value that learners derive through spontaneous interactions with various items, which in turn, transform the learners' understanding.

The descriptions detail how the teachers' practices were dictated to by hierarchical requirements prompting them to focus their goal of teaching towards the successful

completion of weekly tasks as evidence of assessment processes (and to justify that learning was occurring). Consequently, the teachers were facilitating learning activities with restricted spontaneous dialogue, limited free opportunities for play and choice, and few actions that constitute the very tenets of the pedagogy of play. However, there were instances of construction play with wooden blocks that demonstrated seamless engagement in creative processes, revealing emergent mathematical thinking – as illustrated by a dialogue between two learners making cars and counting numbers. In the process, the learners were aligning their play with mathematical concepts without the need for traditional assessments.

Language and culture are strong elements at play in the Grade R classes at Windy Meadows; furthermore, given that culture, language, and thought are interdependent, there is plenty of potential for these elements to enrich teaching through play. English language instruction is central to teaching and learning, even though this presents difficulties in deriving meaningful understanding. There was social interaction between the learners in their mother tongue, but this was limited to free play, and it could be argued that the learners' development was occurring with a lost sense of their own culture and identity. There was a lack of acknowledgement of the learners' prior experiences being incorporated as a resource for building on, as indicated in the activity system. There was also only limited input from the learners in the production of knowledge within the activity system (refer to Figure 5.3).

The potential negative impact on learners' understanding and knowledge uptake is a critical consideration, as it indicates a misalignment with the principles of sociocultural theories of learning, particularly when reflecting on the importance of ZPD. The learners' knowledge, to a large extent, was not being co-constructed actively through play and free play was not guided or valued by the teachers as a vehicle to provide insight into the learners' knowledge and culture. The analysis shows a consistent thread, with examples of the over-reliance on rote learning techniques and underutilising the learners' inherent potential. These techniques limit the extension of knowledge within the ZPD, inhibiting the learners from reaching their full cognitive, and executive potential. The teachers tended to see knowledge as passively transferable, overlooking the value of active engagement; they thereby neglected the rich diversity of cultures, languages, and experiences brought by the learners themselves.

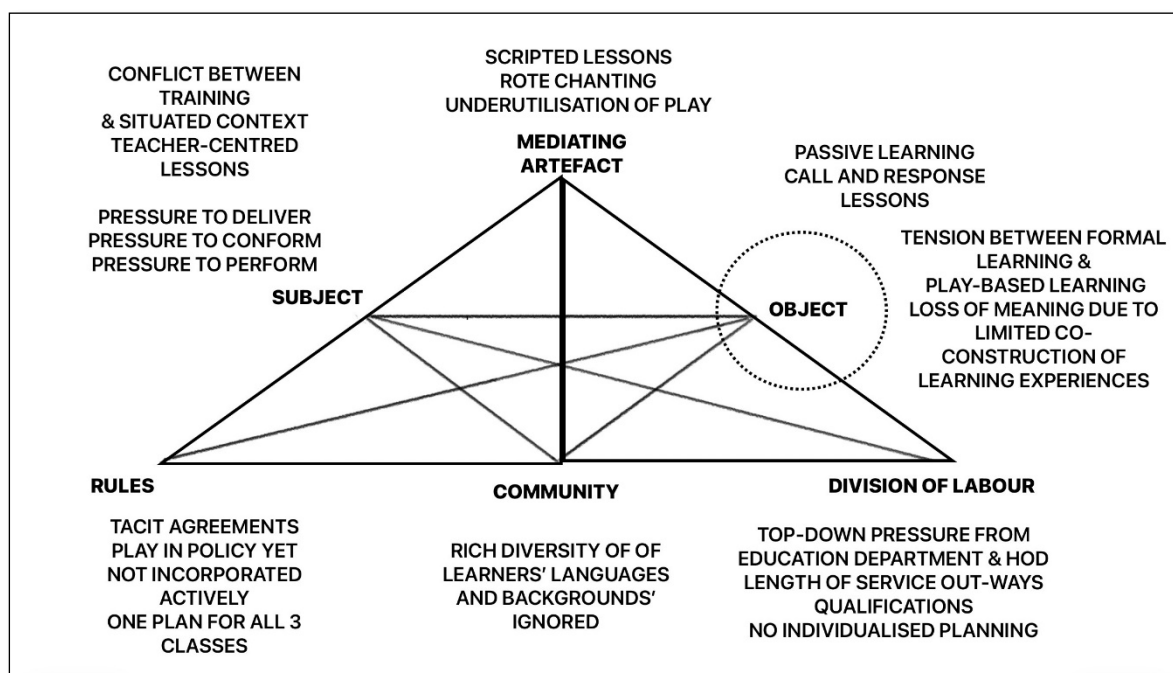


Figure 5.3: Activity System Analysis: Adapted from Cole and Engeström (1993) This first theme and the examples provided an analysis of how the teachers organise and deliver emergent mathematics lessons and the degree to which this is done through play. In this theme, the primary contradiction identified related to a tension revealing itself in the form of a struggle between play-based, child-centred approaches versus institutional demands and formal learning.

5.3 THEME 2: NAVIGATING PLAY-BASED MATHEMATICS AMID CONSTRAINTS

The research question aims to investigate the implementation of play-based mathematics at Windy Meadows. To address this question, the analysis in this theme centres on three key challenges that hinder the effective integration of play-based emergent mathematics in the Grade R classes. These challenges include issues related to diversity, the formal implementation of assessment processes, and the lack of hands-on support in facilitating meaningful play-based mathematical experiences.

This theme aims to achieve the research objectives by examining the perspectives of three teachers. It aims to uncover the obstacles they face in balancing the promotion of emergent mathematics and the development of life competencies through social

interaction and play, against the traditional emphasis on preparing learners to meet the standards set by the education system. Moreover, the analysis underscores the limitations within the activity system, exacerbated by challenges stemming from diversity challenges and socio-economic factors, resulting in disturbances within the activity system itself.

5.3.1 Challenges of Diversity and Teachers' Beliefs

Teachers' beliefs refer to the convictions, attitudes, assumptions, and values that teachers hold about various aspects of teaching and learning (Feiman-Nemser, 2008). These beliefs shape teachers' perceptions, decisions, and actions in the classroom, influencing how they approach curriculum design, instructional strategies, classroom management, and interactions with learners (Harford & MacRuairc, 2008). Beliefs can be influenced by personal experiences, educational training, cultural background, philosophical orientation, and exposure to ongoing professional development. They play a significant role in shaping teaching practices and ultimately impact on learning environments and learning outcomes (Ball, 2000). Beliefs are constructed over time. They can include the common-sense assumptions and taken-for-granted ideas, belief systems, and myths that groups of people share and through which they understand each other. Beliefs articulate and convey formal and informal knowledge and ideologies. They are constantly being reproduced and constituted and can change and evolve in the process of communication (Kay, 2023).

This sub-theme aims to fulfil the research objectives by examining the perspectives of three teachers and their strategies for addressing the highly diverse backgrounds of their learners. It probes a central challenge in early childhood education, namely the inherent tension between promoting life competencies and nurturing social development through play, in contrast to the traditional emphasis on preparing learners to conform to the demands of the schooling system. The discussion explores the challenges of loss of meaning in language. Furthermore, the analysis highlights the strain within the activity system, intensified by socio-economic challenges that lead to disruptions within the same activity system.

At Windy Meadows, the learner population is characterised by diversity, with parents choosing migrant work as a means of supporting their families, travelling from various Southern African Development Community regions to the Cape Town Metropole for

entrepreneurship or informal work opportunities (Thompson, 2018). Despite the medium of instruction being English, the learners' home languages reflect rich backgrounds, including isiXhosa (45%), English (37%), Shona (6%), Chichewa (2%), Swahili (1%), Arabic (1%), and French (1%). This linguistic diversity poses a challenge for the three English-speaking teachers to overcome in meeting the unique needs of each learner. In addition to needing to facilitate cultural and linguistic diversity, the teachers are tasked with accommodating the socio-economic difficulties stemming from the learners residing in impoverished areas.

5.3.1.1 Supporting Diversity Through Play-Based Learning

The analysis here explores the frequent manifestations of antisocial behaviour within the diverse Grade R classroom environment at Windy Meadows. This pertains specifically to observed instances of violent gestures and utterances exhibited by several learners. The discussion enlists an example that illustrates clashing home and institutional experiences. These present as crises for the learners, including the extent to which play could be directed by the teachers to address these crises.

The teachers at Windy Meadows commence their day with the crucial administrative task of attendance register-taking, a practice deemed essential, owing to the precarious location of the school in an area marked by frequent shootings and gang-related strife. The majority of learners reside outside this dangerous location and rely on public transport to reach school. They travel from informal settlements such as Dunoon, Jo Slovo, Langa, and Delft on the outskirts of Cape Town. Travelling in taxis or buses with older siblings is the norm for most, while only a few learners walk to school accompanied by their parents.

Personal safety is a constant concern for the three teachers who daily shoulder the responsibility of caring for their learners. For example, one learner in Teacher A's class resided in an area referred to as "the vlei",¹⁴ a site where her father, allegedly a gangster, had been fatally shot. This learner faced additional challenges with learning delays linked to foetal alcohol syndrome. In Teacher A's class, interpersonal conflicts were commonly observed among boys often manifested in the use of profane language and provocative gestures, such as "throat-slitting" and "middle-finger" gestures. When these violent

¹⁴ A vlei is Afrikaans for dam

instances occurred, the learners would tattletale on each other, thereby showing an innate sense of morality. This sense contradicts many of the learners' lived experiences outside Windy Meadows and demonstrates the need for more sensitive measures to address the children's actions and motivations. Furthermore, the learners were reprimanded by Teacher A for their actions without any alternative forms of behaviour being modelled or offered – other than being reminded that this acting out was unacceptable at school. This highlights a secondary contradiction in the activity system; since self-regulation is oppressed, subsequent imbalances and tension are likely to appear.

Vygotsky describes how becoming an adult in society requires children to manage relational processes and that, through the medium of play, children engage with a range of emotions. Whether it is confusion, excitement, frustration, or joy, children learn to regulate their emotions during play (Bodrova et al., 2013). In doing so over sufficient time and within ever-changing contexts, children begin to develop an understanding of self, and become agentic and in touch with themselves (Stetsenko & Ho, 2015a). Through negotiation and problem-solving in play scenarios, they develop the ability to manage and express their feelings appropriately. This idea, closely associated with periods of growth resulting from mediation in the ZPD, highlights the importance of critical periods in children's development where they are confronted with crises that lead to conflict and transition, and ultimately growth (Hedegaard & Lyberth, 2020). Hedegaard maintains that these crises are fundamental to children becoming and mastering the skills that are demanded by life and maintains that these crises require supportive conditions that promote social development in ECE. Furthermore, Hedegaard and Lyberth (2020) add how, through play, children can orient their behaviour in novel and not fully realised actions, as described in detail in Vygotsky's works on the ZPD and cultural mediation.

Writing from a CHAT perspective, Veresov et al. (2021) address the role of adult intervention in play, looking at both the degree of adult participation and the type of adult-led participation in play. They further explore the extent to which these interventions influence executive functioning in early childhood. Their findings demonstrate that guided play has a positive influence on children's executive functions. They describe how some play exhibited is relatively simple, yet at times complex and lengthy, necessitating the need to develop these within the ZPD and with adult support. Their analysis describes how adult-led support yielded a positive impact on inhibitory control and cognitive

flexibility, with the adults assuming the guiding role when required, assisting children in orienting themselves within the play contexts.

In light of these theoretical underpinnings, it could be inferred that the observed aggressive behaviour was deemed as antisocial behaviour by the teacher ; however, such understanding of the behaviour fails to recognise that this behaviour reflects the lived experiences of the children and therefore demands assistance and guidance from an MKO. The findings from the analysis indicate the need for promoting and engaging with learners in situations where they face conflict and are encouraged and guided by the teachers within the ZPD – possibly through role play – to explore diverse perspectives and emotions related to conflict. Through these creative activities, children can develop empathy, problem-solving skills, and an understanding of varying viewpoints. This will foster their ability to navigate and comprehend real-life conflicts more effectively, even in instances where violence is prevalent (Fleer, 2023).

5.3.1.2 Teachers' Values of Diverse Languages

The analysis here describes the teachers' views of language, and how these views consequently influence learning experiences and shape identities. It details the extent to which they are managing to achieve this within the diverse Grade R activity system with attention to four emerging tensions. These are: i) the undervaluing of home languages, ii) the promotion of English as the language of learning and communication and the associated difficulties in acquiring emergent mathematics in a second language, the sole allowance of home language in free play, and iv) Afrikaans creeping into daily practice although it is not part of the curriculum.

The teachers at Windy Meadows expressed pride in the learners' progress in English. They highlighted their significant improvement, noting that many learners who initially had limited English proficiency and who could barely understand the language at the beginning of the year, were able to cope in class. They explained how, within six months, these learners were able to both comprehend and communicate effectively in English. However, in contrast, the teachers appeared less in touch with the learners' diverse backgrounds, including their countries of origin and home languages. When asked where the learners came from or what language the learners spoke, they were unable to answer. Clarity on this matter emerged later, only after direct communication with the learners

and following a request for the teachers to provide a record of the different languages spoken.

Additionally, the analysis of observations revealed limited provision of opportunities for learners to engage in unstructured social interaction in their mother tongue within the classroom – and especially during planned teacher-guided activities. While participating in group activities at their tables and during mat time, learners spoke exclusively in English. However, during play, such as “free play” with blocks, they reverted to their mother tongue and utilised code-switching.¹⁵ Markedly, learners often chose to play with friends who shared the same mother tongue. A further noteworthy observation was that when conversing in their mother tongue, the discussions were subdued and almost whisper-like, and interestingly when they switched back to speaking English, the discussions would be louder and expressed in a more forced manner – especially when the audio recorder was nearby.

One morning, a learner was engaging in free play using wooden blocks designed for and associated with “construction play”. This learner was using a wooden cylinder-shaped block, to act out fantasy play, a scene from his home where he was pretending to eat a mielie and held a lovely conversation with another learner about the blocks and what they were building. The young learner with whom he was speaking English appeared to be speaking with an American accent, and when pressed for more information as to why he was speaking with the accent, Teacher M replied that she was not sure and thought it might be from the television programmes that the learner viewed, adding: “Yes, he speaks nicely, his mommy too!”

At the end of the year, the highlight for teachers, learners, and parents was the Grade R graduation ceremony, typically held on a Saturday morning to accommodate the parents’ inflexible work schedules during the week. The ceremony was a joyful occasion where the three classes shared poems and songs they had practised extensively in English. One notable moment occurred when, amid the English performances, the children surprised their parents by singing the Afrikaans part of the South African anthem, evoking

15

Code-switching refers to the practice of alternating between two or more languages or varieties of language in conversation or within a single discourse. It can also refer to the use of different linguistic styles or registers depending on the social context, cultural background, or the speakers' identities Excell, L., & Linington, V. (2022). *Teaching Grade R* Juta.

emotional reactions of appreciation and awe, standing out from all the other items presented at the ceremony.

The interconnectedness of language, identity formation, and educational practices highlighted in the aforementioned scenarios carries several significant inferred implications. Language plays a crucial role in the formation of identity during early childhood. It serves as a powerful tool for communication, self-expression, and social interaction, shaping a child's sense of self and connecting them to their cultural and social context (Vygotsky, 1962). Moreover, a strong element in CHAT is the ever-important presence of the individual's past. This impacts on the nature of current and future engagement, which naturally encompasses identity and language (Cole & Engeström, 1993).

Engeström (2000) details how activity systems are strongly linked with social interaction, and this stems back to the writings that describe how language constitutes a crucial element in the development of identity. Children, in their formative years, gain insights into social roles, relationships, and expectations by engaging in conversations, play, and shared activities. The language they engage in becomes a reflection and reinforcement of their evolving identity, empowering them to navigate and negotiate their roles within diverse social contexts (Vygotsky, 2012).

By whispering their home language, the Grade R learners at Windy Meadows seem to have subtly adopted the societal norms that devalue indigenous languages. This behaviour suggests an internalisation of the societal pressure to conform, leading them to express their native language in a hushed manner. This highlights an unspoken, tacit agreement within a specific activity system. During a discussion, the tacit language rule was acknowledged by Teacher M, who confirmed purpose in advancing English language learning. Furthermore, the unmistakable pressure on teachers to adequately prepare learners for Grade 1 was evident, as indicated by remarks on how learners were expected to handle formal instruction in English by Grade 1. Teacher M emphasised this pressure by recalling comments from a Grade 1 teacher, questioning why a learner could not write and expressing frustration with her perception that there was excessive play in Grade R. On reflection, it was noteworthy to observe Teacher M's perception of the American accent as superior, a sentiment that resonates with the insights of Hardman (2008) and

Von Esch et al. (2020). These scholars highlight how teachers' epistemic assumptions can significantly shape their thinking and actions.

Considering the historical association of Afrikaans with the apartheid regime, the parents' resounding positive response was interpreted as conflicting and contradictory. During a subsequent focus group meeting with the three Grade R teachers, this observation was discussed with the teachers. Teacher A proposed that parents might have been surprised and impressed that, within 11 months, not only had their children learned English but could also sing in Afrikaans.

Throughout the year, the teachers had facilitated and actively promoted the learners' actions and thinking in English, their second additional language. This practice, accepted by both teachers and parents, appears to be considered a necessary measure for success, as English and Afrikaans take precedence over the learners' mother tongue in this activity system. This finding is not an exclusive finding related to Windy Meadows itself and speaks to the global picture stemming from capitalism and neoliberalism that views and promotes English as the superior language (Stetsenko, 2019, 2021). Under neoliberalism, English is often viewed as a valuable commodity. Proficiency in English is seen as an asset that can enhance individual employability, access to global markets, and socio-economic mobility (Maistry & Africa, 2020). Neoliberal views consider language proficiency, particularly in English, as a form of human capital. This perspective encourages investment in English language education as a means to improve individual economic prospects and productivity (Bonawitz et al., 2011; McGuigan, 2005).

The analysis revealed observable tension within the activity system in the form of a tertiary contradiction, namely; a struggle between preserving culture and identity through the medium of play or by forging ahead with formal learning driven by socio-economic aspirations where English language proficiency subordinates minority languages as English identifies with power and economic prosperity (Hoadley, 2017); (Von Esch et al., 2020). As shown in Figure 5.3, the activity system clearly lacks recognition of the learners' histories and cultural backgrounds, as evidenced by the relationship between the subject (in this case, the learners) and the object (the learning) of the activity.

While the teachers were making progress in managing the learning expectations placed on them to ensure the uptake of English, this came at a certain price where the individual

learners lacked the freedom to communicate with spontaneity and provide evidence of their unique understanding. Moreover, there was a separation occurring with that of informal learning, free play and formal learning, planned activities, and interaction at their tables based on language. Additionally, the analysis described the mediating role that language plays in facilitating learning. The observations and discussions revealed that the three teachers prioritised the learners' economic prosperity over their origins and home languages, indicating the presence of conflicting views within the activity system. This suggests an alignment with the learners' parents' desire for their children to achieve economic success, while also highlighting an obvious absence of recognition of the learners' histories and cultural backgrounds, as evidenced by the relationship between the subject (the learners) and the object (the learning) of the activity, as shown in Figure 5.9. Moreover, it can be inferred, as articulated by Hedegaard (2009), that the teachers' views and actions were linked to seeing each child as a scholar and not as a unique young child.

The analysis identifies the problematic presence of a discourse of productivity with the central premise being that children are in a system that encourages contributions to the building of a strong economy. This is regardless of the collateral damage such as the loss of culture, identity, and creative ways of being and knowing. It can also involve the loss of the ways children actively produce on their own social and create their psychological realities. In this study, this was particularly pertinent to migrant workers' children.

As argued in the last two chapters, language and visual imagery do not simply "reflect" or describe reality in play-based learning, but they also play an integral role in constructing reality and experience. Play resides in the learning and conversely, learning is in the play. This results in the outcome being a state of mind and a way of being, rather than a product that can be tangibly measured (Ryan, 2006).

5.3.2 Assessment Constraints that Limit Play

This sub-sub-theme explores the impact of assessment on Grade R classes at Windy Meadows. It researches how teachers navigate the challenge of balancing play-based learning with the need to provide evidence of their assessment practices. Using empirical examples, the analysis illustrates how, with policy-driven pressures, teachers at Windy Meadows are drawn towards formal assessment away from play-based assessment practices.

The section is structured into two parts, with the first part focusing on a comparison between policy and practice, and the resulting experiences and perceptions of teachers. The second part explores the characteristics of emerging mathematics assessment activities. These perceptions are explained through the examination of linguistic cues, which offer insight into the prevalence of dilemmas, double binds, and conflicts.

5.3.2.1 Policy, Practice, and Surfacing Tensions

According to CAPS, Grade R assessments should be informal and consist of checklists that build a picture of the learners' strengths and areas still requiring more time to develop (DBEa, 2011b, p. 19). As described earlier, every Friday was the day left open for assessment of concepts covered for that particular week. These assessments were done for all three subjects and took the form of a worksheet or a written activity, because according to the teachers, their head of department (HOD) required evidence to support the results in their termly progress reports. Apart from occasional variations, the tasks were identical to the ones "practised" in the week.

The three teachers at Windy Meadows compiled customised assessment booklets for each subject, in addition to fulfilling the DBE's requirements for write-ups, observation checklists, and intervention registers. Each subject had four assessment booklets, resulting in an annual total of twelve paper-based assessment booklets per learner. In mathematics, the learners' assessments consisted of a total of twenty-seven worksheets covering all five areas of mathematics (refer to Table 5.1, for document analysis detailed in footnotes).

Table 5.1: Mathematics Assessments

LIST OF MATHEMATICS ASSESSMENTS (the number of assessments in brackets after the term)			
TERM 1 (6)	TERM 2 (8)	TERM 3 (7)	TERM 4 (6) ¹⁶
Numbers Operations and Relationships	Numbers Operations and Relationships	Numbers Operations and Relationships	Numbers Operations and Relationships
Worksheet Counting: 3 elephants	Worksheet Counting and circling	Worksheet Colour_by number Firefighter	Worksheet Join_the dots 1–10 Identify the picture:

¹⁶ Fourth term booklets are moderated and sent to HOD.

2 dolphins 1 puppy Writing_numerals 1,2,3	(and colouring) ¹⁷ 1 umbrella 2 torches 3 horseshoes ¹⁸ 4 fans 5 keys	Identify numbers 6,7,8	aeroplane
Numbers Operations Relationships	Numbers Operations Relationships	Numbers Operations Relationships	Numbers Operations Relationships
Worksheet Count and circle the amount: 2 gloves 1 boot 3 umbrellas	Worksheet Adding one and totalling Ladybirds: 1 spot to 1 1 spot to 2 1 spot to 3 ¹⁹ 1 spot to 4 Writing 2,3,4,5	Worksheet Count the objects and write the correct number 1 flag 2 storks 3 proteas 4 pots 5 soccer boys 6 R5 coins 7 cricket bats 8 cricket balls	Worksheet Write in the missing numbers in six sequences counting until 10. Final sequence write 2 – 10 ²⁰
Space and Shape	Numbers Operations Relationships	Space and Shape	Space and Shape
Worksheet Draw two birds above bridge Draw a car below the bridge Draw three frogs below the bridge ²¹	Worksheet Matching, cutting, and pasting Dots with numerals and fingers 1–5	Worksheet Identify/ select and colour shape from in three everyday items Triangle – sandwich Square- play block Circle – clock Oval – watermelon	Worksheet Copy a grid pattern of a tree on a larger scale.
Patterns and Functions	Space and Shape	Space and Shape	Patterns and Functions
Worksheet 2 x 6 blocks provided	Worksheet	Worksheet Symmetry	Worksheet

¹⁷ Why is it necessary to colour, what mathematical concept is being assessed?

¹⁸ Are these items relatable to the learners?

¹⁹ Confusing as later, they are required to understand the line of symmetry.

²⁰ Error here, only one dot but a two-digit number – conflicts with one to one correspondence.

²¹ The instructions are written, yet they cannot read, so the worksheet needs teacher to read out the instructions. Task further complicated by language barriers, as they are mostly learning English for the first time. It is also testing Numbers Operations and Relationships. Do they know that “a car” means “one car”?

Make a colour pattern	Identifying and colouring Square Triangle Circle	Complete (draw) the halves of two similar but not identical houses ²²	Create a colour pattern using three colours Repeat the pattern Complete a frill around the edge
Measurement	Space and Shape	Patterns and Functions	Measurement
Worksheet Colour in small and circle big Balls, suns, swimming costumes, lollies, suns, bucket and spades, umbrellas, shorts, ice creams ²³	Worksheet Draw a cat next to a tree Draw a boy on a slide Draw a bird above the cloud Draw a monkey up in the tree Draw an insect below the sun Draw a girl next to the flower Draw a dog underneath the slide	Worksheet Create (draw) a colour pattern (8 blocks) Create (draw) a shape pattern (8 blocks) Create (draw) a size pattern (8 blocks)	Worksheet Volume Write more or less next to each picture Jugs, bowls, glasses, bottles, buckets, cups ²⁴
Date Handling	Patterns	Measurement	Data Handling
Worksheet Cutting and sorting shapes into 3 categories stars, squares, ovals ²⁵	Worksheet Identify and continue the shape pattern ²⁶	Worksheet Circle the light objects and colour in the heavy objects Ant, car, elephants, pillow, whale, balloon, feather, baby ²⁷	Worksheets Identifying and counting items Shoes, shorts, caps, vests, skirts, blouses, dresses
	Data Handling	Data Handling	
	Worksheet Drawing the correct number of shapes:	Worksheet	

²² Problematic and confusing task refer to case study on symmetry for detail.

²³ Learners need guidance as unable to read instructions.

²⁴ Problematic, as written task is inappropriate. Also, pictures are unclear.

²⁵ Is the oval an appropriate starting point as opposed to a circle?

²⁶ Do Grade R learners know about diamond shapes?

²⁷ Potentially confusing as the objects are not close to scale in relation to each other.

	1 circle 4 squares 3 triangles 2 rectangles	Count the animals and write the number in the corresponding block.	
	Measurement		
	Worksheet Cut, paste, and decorate worms Order from smallest to largest		

The individual interviews offered a clearer understanding of the specific assessments undertaken for each term. They also shed light on whether the three teachers were obligated to complete tasks required by the Department of Education (DoE) in addition to their assessments. Teacher S responded by saying that they were not given any set tasks to complete, other than the blue DoE Grade R books that have checklists with tick boxes. Teacher S added that they were not required to use number codes, unlike the codes that they had elected to use in their booklets.

When pressed for her opinion on whether she felt that she expected to receive more support from the DoE – given that they expected so much from them in terms of the reporting process – Teacher S was reluctant to give feedback. The teacher ended the discussion on that topic by saying: “I do feel that way. But, um, you know that is a discussion on its own, honestly, that is something totally on its own.”

When asked to consider what aspect of the day-to-day teaching was their least favourite, all three teachers indicated that it was the assessment of administrative tasks related to their jobs. Teacher S discussed the load they all faced in managing the paperwork for assessment and then having to manage their home life too:

Where in the day do we find the time to do this, ‘cos at the end of the day we all have our own families and responsibilities ... we have so many things, and we dread the end of term every time because it’s just too much! Honestly, it is just too much! (Teacher S)

However, Teacher S then quickly refuted this, adding that eventually they managed to find time to complete their tasks with the help of their HOD. The HOD explained to them how to fill in their mark sheets correctly and oversaw and moderated their assessment booklets, and also calculated the percentages for them. During Teacher A's first individual meeting, when asked about her experience of studying in terms of relevance to the realities in the classroom, Teacher A said that she felt them to be quite different. When pressed for details as to how this difference presented itself, she initially had some difficulties articulating it. Then quite unexpectedly, she turned, gesturing to their versions of assessment booklets stating:

So basically, that was just an overall assessment, um, to test the learners on what they've done for the term, but that's not what they want. That's not how they – we, we don't like – they don't like the way that, um, you assess a child like that, because you shouldn't mark a child, you shouldn't code a child. You should make them like they're competent or not competent, or if they're still struggling or what have you done. (Teacher A)

In CHAT, critical conflicts refer to situations where individuals grapple with inner doubts, feeling numbed by contradictory motives that cannot be resolved independently. Linguistic clues indicating such conflicts include emotionally and morally charged narratives, and the use of strong metaphors (Engeström & Sannino, 2011). Following Vygotsky's work on the role of discourse in activity theory, (Sannino, 2008) remarks on the manifestation of such conflicts through exhibited feelings of struggle or guilt, which often, if unaddressed, result in suppression, which is ultimately an unhealthy and unproductive state. In writing on Vygotsky's views of hierarchical influences in activity theory, it is argued that to address imbalances, a more flexible and responsive understanding of rules is required (Sannino & Engeström, 2018; Stetsenko, 2016). Their arguments provide a strong stance with regard to the role of participants in CHAT, highlighting the need to consider the co-construction of rules within the social context of the activity, and consequently fostering a more inclusive and adaptable conceptualisation of how rules operate within activity theories.

The textual analysis in the aforementioned instances indicates how Teacher S was experiencing a double bind with two incompatible perceptions. These involved strongly acknowledging the need for greater support on the one hand, yet, being constrained by a

sense of loyalty to the DoE and HOD in terms of hierarchy, on the other hand. In the latter case it is implicit (“tacit”) that junior employees do not criticise management, suggesting that, up until this point, the Grade R teachers at Windy Meadows had not considered questioning the status quo regarding assessment processes and protocols. Teacher A and Teacher S were experiencing critical conflicts, as they strongly articulated that their jobs were constrained by a lack of time, as well as top-down pressure to adhere to unrealistic assessment expectations that were imposed on them. This demonstrated the division of labour and tensions emerging as “rules” within the networks of relations between teachers, the learners, the teachers’ superiors, and education department officials that govern the nature and outcome of activity. The rules often constrained and limited the course of action taken by the teachers. Teacher M was less vocal about the pressure to conform to top-down rules and maintained a keen focus on meticulous planning to coordinate the three classes and “not wasting time” was central to her actions.

In this section, the analysis described the need for the teachers to provide evidence of their progress in teaching as a tension emerging, driven by the influence of a top-down approach and more formal assessment processes existing in the higher grades. The analysis captured the activity system’s imbalance that was largely the result of the strain brought about by assessment pressures exerted on the teachers who, in turn, gathered excessive evidence of written tasks for all the learning areas – despite their expressed acknowledgement of the limitations about how accurately the tasks portray the learner’s actual progress (refer to Figure 5.3 to see the strain captured in the activity system).

5.3.2.2 Emergent Mathematics Assessment Tasks and Implications

In this sub-section, the nature of assessment tasks is uncovered and analysed to address the research question as to the nature of assessment of emergent mathematics activities, and the extent to which activities were being done using a play-based approach. It suggests that the assessment tasks provided by the three teachers at Windy Meadows were creating disturbances within the activity system. The disturbances are evidenced below through two assessment tasks that the researcher selected from the assessment booklets for the second and third terms. The analysis describes learners grappling with intricate concepts that were presented in an unstructured manner. The inclusion of written instructions despite Grade R learners still being unable to read was conflicting. Language

barriers were evident, and the worksheets heavily emphasised fine motor skills rather than fostering emergent mathematics.

Additionally, the tasks lacked active construction of knowledge; rather, the outcomes were predetermined and disconnected from the lived experiences of the learners. These challenges are exemplified in the ladybird task assessment task from Term 2 listed below where, additionally, learners were confused by the “correct” answers conflicting with their everyday knowledge of ladybird patterns always being symmetrical (refer to Figure 5.4).

:

One morning in the third term, the learners were required to complete an assessment task on symmetry, and many of them were struggling with this paper-based assessment and performed quite poorly with the task (refer to Figure 5.5). This task required complex drawing, with skill requirements exceeding the level of the emergent writing capability of a Grade R learner. Additionally, this assessment task was constrained by the layout, as there were two houses side by side that were similar but not identical. It seemed that having two almost identical houses made the learners confused by the layout and many learners made sense of the tasks by using visual closure to make a complete house (although not symmetrical). In many cases, the lived realities of learners at Windy Meadows were those of informal settlement houses which are mostly asymmetrical and consequently (and understandably) the learners’ understanding of the symmetrical house assessment task seemed to be lacking. They also appeared overwhelmed and unsure when asked to explain their drawings. They made no connection with the concept of symmetry and volunteered answers such as: “I am making a house ... I am drawing a window.”

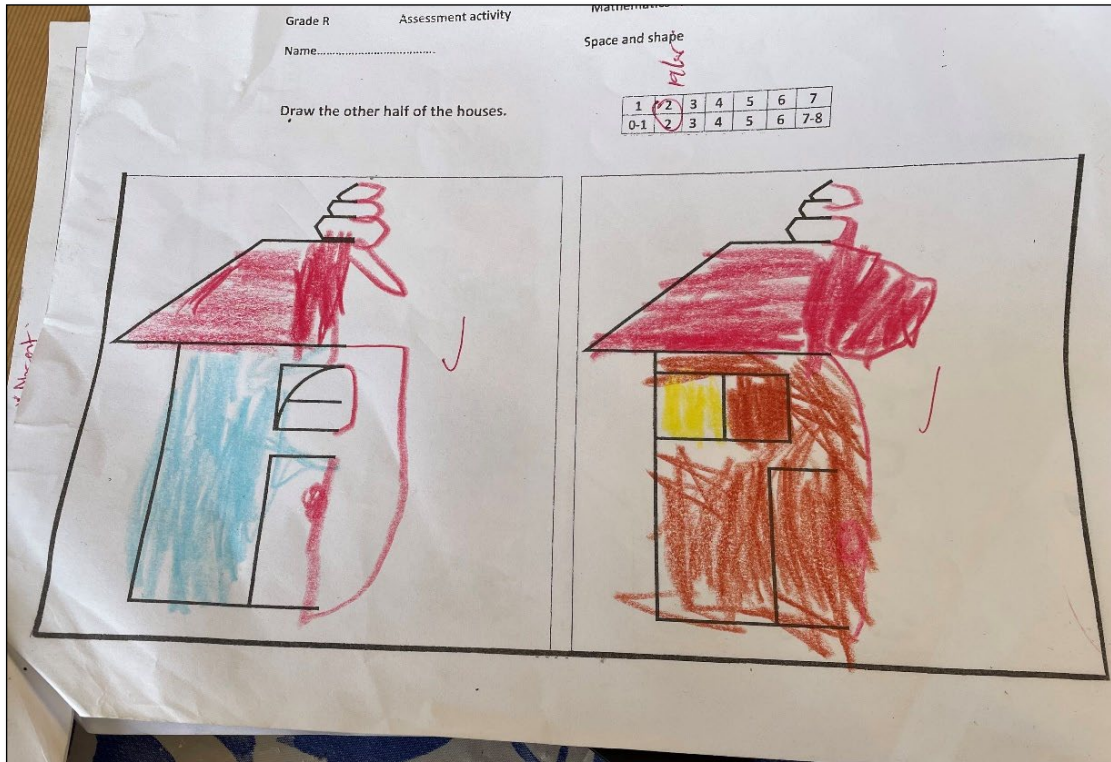


Figure 5.4: A Learner's Assessment on Symmetry

Additionally, there was insufficient space provided for the learners to complete the mirror image of the two houses, even if they had grasped the concept of symmetry. With few exceptions, the learners performed poorly on this task²⁸; this meant that the average for the overall performance for the term was lowered significantly. This task accounted for eight out of sixty-four marks (12,5%) of the Term 3 mark allocation (refer to Figure 5.6) for the rubric that the three teachers had drawn up and used. It was also noted that on occasions, when being pressed to reflect on the nature of assessment tasks, the teachers sometimes contradicted themselves. For example: Teacher S described how by the third term, the assessments that they designed were a “notch up”, mentioning how, as a beginner teacher she would do the task with the learners, but then added: “To be honest with you, we explain the lesson so in-depth that they know it!”

²⁸ One learner, who's dream is to become a fashion designer and who drawings are very advanced, completed this task accurately

Observation sheet
 Assessment
 September 2022

Name: [Redacted]

Rubric		1	2	3	4	5	6	7
Mathematics								
1	Number operations and relationships							
2	Number operations and relationships			✓				✓
3	Space and shape							
4	Space and shape		✓					
5	Patterns and functions						✓	
6	Measurement					✓	✓	
7	Data handling					✓		

	3	4	2	7	5	3	
14	8	8	8	14	8	8	68

Teachers signature:

Date:

Figure 5.5 : Termly Assessment Rubric

Utilising Vygotsky’s theory of mediation through play as a medium for cultivating creative and supportive instructional settings, Wager and Parks (2016) argue that teachers need to be able to recognise mathematical opportunities. These need to be identified as they emerge in play-based environments and shape these opportunities, thereby guiding them towards new understanding. Similarly, drawing on CHAT as a framework for understanding policy and practice tensions, Kay (2023) cautions against the occurrence of early childhood assessment practices that are oriented towards primary school culture. Instead (and in line with an early childhood classroom activity system), the outcome should be school readiness brought about through holistic development (Kay, 2023, p. 7). Similarly, utilising the ZPD as a basis for instruction, Gindis (1999) describes how the process of individualised attention is fundamental to finding and stimulating maturing functions in learners, those functions that are still unable to perform independently unless only through imitation.

In terms of CAPS, Grade R learners are only required to recognise symmetry in their bodies as well as identify and draw the lines of symmetry in 2-D shapes (geometrical and non-geometrical shapes) by the 4th term (DBEa, 2011b, p. 27). These suggested requirements are significantly less complex than the skills required for the prescribed assessment provided to the learners by the three teachers. The CAPS requirements align with the capabilities of an emergent Grade R learner who uses a sense of embodiment to explore and understand complex processes (Excell & Linington, 2022).

Thus, in this section, the findings suggest that the assessment tasks administered by three teachers at Windy Meadows created disturbances within the activity system and did not utilise the learners' situated knowledge and contexts as platforms for engagement. The teachers' reflections on assessment tasks sometimes revealed contradictions, with statements indicating a perceived acknowledgement of the limitations of the assessment booklets. These included the acknowledgement of personal involvement in completing tasks with learners, but also displaying a sense of pride in their designing of the tasks. Overall, the analysis in this section suggests a misalignment between the assessment tasks and the developmental level of Grade R learners, emphasising the need for a more play-based and developmentally appropriate approach to assessment in early education. An additional finding hints at the need for the teachers to "prove" their worth to the rest of the school at Windy Meadows so as to validate themselves and the grade.

5.3.3 Lack of Support

In this sub-theme, the analysis highlights the Grade R class teachers' significant struggles with structural challenges, primarily stemming from inadequate funding and a lack of teaching assistants. It describes how the absence of teaching assistants adds to their burden and requires the three teachers to independently manage large classes while catering to diverse learning needs. This, in turn, impacts the learners, who feel unwelcome, stifled, and under-stimulated at times. With an example as an illustration of an emergent mathematics-related observation on puzzle-building, the analysis describes how the teachers' lack of time hampers the provision of individualised attention and support that diverse, play-based classrooms require. This situation negatively impacts the optimal development of each learner.

Linked to the issue of a lack of time resulting from assessment demands, is the lack of hands-on support that is aggravated by absenteeism and dearth of back-up teachers. As part of COVID-19 pandemic reparation, the three teachers in 2021 were provided with one teacher assistant who was shared between the three classes. Teacher M described the experience as positive, with the teachers “fighting” among themselves to share her, mostly owing to her hands-on approach. However, in 2022 the position was terminated, and classes resumed as normal, despite²⁹ the teachers’ need to address gaps resulting from missed classes. Added to this, the Grade R teachers were required to mention early intervention as part of ensuring learners are ready for Grade 1.

When interviewing Teacher S, the discussion turned to supporting learners with special needs. Teacher S highlighted the challenge of providing one-on-one support, given the large class size and diverse needs. Moreover, Teacher S expressed a lack of adequate training in inclusive education, specifically regarding identifying barriers to learning and providing appropriate support. The diverse range of special needs (including foetal alcohol syndrome, autism spectrum disorders, oppositional defiance disorders, and sight and speech disorders) adds further complexity to the classroom composition at Windy Meadows.

Linked to this was the lack of additional teacher support when the teachers, were absent due to poor health or family circumstances. Specifically, Teacher A’s frequent absences due to her health issues led to her class being split between Teacher M and Teacher S on the days that she was absent, resulting in a 50% increase in the learner intake for the other two classes. This arrangement posed various challenges, including limited space for the additional learners, increased demands on the teachers, and reduced individualised attention.

The analysis of observations and remarks, especially in the case of Teacher S, suggested a potentially unconscious resentment toward the learners based on the added strain of the additional learners being forced into her classroom space. On a specific morning when extra learners joined the class, it was noted that Teacher S did not involve them in any worktable-planned activities. Instead, the visiting learners were instructed to “watch” and

²⁹ With the introduction of inclusive education in 2001, the need for additional teacher assistance in Grade R became a necessity. However, due to limited government funding, many Grade R schools are still without this additional support.

were informed that they would be doing the same work when their regular teacher returned the next day. They were relegated to drawing or playing, unsupervised, in a cramped space (see Figure 5.7).



Figure 5.6: Cramped Play Area

Throughout the 6-month observation period, it became evident that the three teachers had minimal personal spare time. They consistently expressed a shared concern about the absence of any free time during the day – even a moment for a bathroom break. They bore sole responsibility for the learners, from their arrival in the morning, through break times, and even after school (when some learners wait for their older siblings to finish classes). Weather permitting – and in the absence of reported gang-related incidents – the learners were allowed outdoor play on the field adjacent to their classrooms. On rare occasions, teachers relied on each other to briefly supervise their learners, enabling a quick bathroom break or a visit to the staff room to heat food. Towards the end of the year, a noticeable decline in the teachers’ well-being was observed, leading to increased instances of absenteeism.

As the three teachers were increasingly stretched for time, the circumstances limited their capacity to be available to cater for the diverse needs of their learners. This, in turn, created more tension within the activity system and impeded the learners’ capacity to

effectively navigate activities that required adult guidance and intervention. For example, the area of difficulty for the learners was their limited spatial awareness that is crucial for mathematical proficiency (Verdine et al., 2014). Puzzles were seldom provided to the learners, and those available were in poor condition, irrelevant to the learners' experiences, and not easily accessible to them (refer to Figure 5.8). The learners approached puzzles haphazardly, lacking an understanding of the overall “picture” they were creating. They struggled to know how to begin, identify puzzle corners, or use the illustration on the box lid as a visual cue for guidance.

During a subsequent focus group meeting, the issue was gently raised, and teachers acknowledged the importance of puzzles. However, they expressed challenges in managing the process, citing difficulties in providing more hands-on guidance to individual learners. They described how, because they were unable to give individual guidance for long, it led to learner frustration – often resulting in puzzle damage and mixing up of pieces. Subsequently, any next learner attempting the puzzle faced compounded challenges. Consequently, the puzzles were mostly stored away barring a few that were already damaged and had limited pieces.



Figure 5.7: Example of Puzzle

Van Oers (2013), using activity theory in looking for clearer terms for defining play, positions the role of the adult under the spotlight. He does this to uncover ambiguous

notions regarding the specific role that an adult assumes in play. Van Oers argues for stricter definitions regarding the adult in the activity system of play-based pedagogy, supporting the writings of Vygotsky, and more recently Karpov (2014). These authors push back against the notion of free play, arguing that this specific type of play is unsupported, and consequently does not contribute substantially to the process of culturally situated mediation. Van Oers (2013) calls for a stronger delineation of parameters for play-based learning, including involvement, rules, and degrees of freedom – thereby providing impetus for the pedagogy of play to be better understood. At the same time, he acknowledges the limitations of adults providing too much structure, as then it calls into question the definition of play. This mirrors the writing of Vygotsky when he describes that any activity has history, rules, and cultural contexts that determine motives and outcomes of and from engagement (Vygotskiï & Kozulin, 1986). It could be inferred that the teachers' rules of engagement and the learners' degrees of freedom were being impacted by the lack of support, sufficient space, and time.

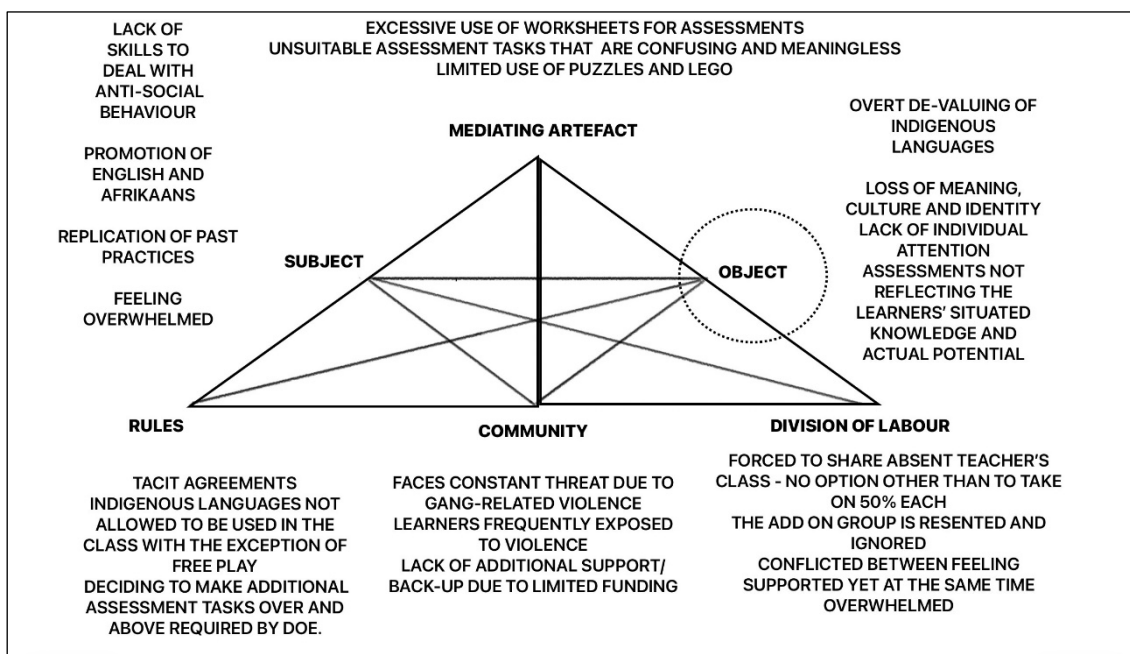
Expanding on Vygotsky's notion of mediation, Cole emphasised the significance of the cultural-historical context in understanding cognitive development. Cole (2017) argued that cognition is inherently embedded in cultural practices and social interactions. Cole further highlighted the role of cultural tools as mediators of cognitive development. Through play, cultural tools such as games and puzzles are seen as activities that can be situated within the learner's ZPD, providing challenges that are just beyond their current level of competence but achievable with assistance. These activities provide a scaffolded learning environment, foster social interaction, and allow for the internalisation of cultural tools and sign systems, contributing to the development of higher mental functions.

In this sub-theme, the analysis described how the Grade R class teachers confront significant structural challenges arising from inadequate funding and a lack of teaching assistants. Insufficient financial resources hamper the creation of an enriching learning environment, and the absence of teaching assistants places an additional burden on Grade R teachers, as they must manage large classes with diverse learning needs independently. This situation diminishes their ability to provide individualised attention and support, hindering the optimal development of each child. Moreover, the strain on teachers contributes to increased stress and burnout, negatively impacting the overall quality of

early childhood education in these classrooms. Addressing these structural challenges is crucial to fostering a more conducive environment for play-based emergent mathematics experiences for Grade R learners.

In this second theme, by way of examples, the analysis highlights several key findings regarding the tension within the Grade R activity system. There is a dilemma between preserving cultural identity through play and promoting formal learning, ultimately driven by socio-economic aspirations. While play-based approaches are often more inclusive and culturally responsive, they may be perceived as less efficient or rigorous compared to formal learning methods. This perception is fuelled by the capitalist mindset that equates productivity with standardised measures of success, such as test scores and academic achievements.

Ultimately, the dilemma between preserving cultural identity through play and promoting formal learning reflects broader societal tensions between cultural diversity and economic homogenisation. In a commoditised education system, these tensions are heightened, as the value of education becomes increasingly tied to economic utility rather than holistic development and cultural preservation. With reference to Figure 5.9, the activity system reveals how English proficiency is prioritised over indigenous languages, which impacts the learners' ability to communicate spontaneously and demonstrate unique understanding. Also indicated in Figure 5.9, there is an imbalance in teaching approaches: following policy rigidly and overcompensating with excessive assessments, prioritising English language proficiency and formal learning over play-based, developmentally appropriate approaches. The activity system is further constrained by overcrowded classes when one of the three teachers is sick, leading to the learners being ignored and made to feel unwelcome. The lack of hands-on support also impacts the nature of the activity being dictated by the extent to which they can be completed without teacher guidance. to administer assessment tasks that do not align with the developmental level of Grade R learners. These tasks often fail to utilise learners' situated knowledge and contexts, leading to a misalignment between assessment methods and learners' needs. Added to this, inadequate funding and a lack of teaching assistants create significant challenges for Grade R teachers.



*Figure 5.8: Activity System
Adapted by Researcher from Cole and Engeström (1993)*

5.4 SUMMARY OF CONTRADICTIONS

In Themes 1 and 2, the primary contradiction revolves around the tension between play-based, child-centred approaches to teaching emergent mathematics and the institutional demands for formal learning. This tension is exemplified by the struggle faced by teachers at Windy Meadows in balancing the promotion of emergent mathematics and life competencies (through social interaction and play) on the one hand, and on the other hand the traditional emphasis on preparing learners to meet the standards set by the education system.

The over-reliance on rote learning techniques and underutilisation of learners' inherent potential emerges as a secondary contradiction. Despite the potential benefits of play-based learning, teachers tend to see knowledge as passively transferable, overlooking the value of active engagement and neglecting the rich diversity of cultures, languages, and experiences brought by the learners themselves. These contradictions are reflected in Figure 5.9.

A tertiary contradiction emerges from the lack of alignment between assessment tasks and the developmental level of Grade R learners. While teachers acknowledge the limitations of assessment booklets and the need for a more play-based approach, they still

feel pressured to adhere to formal assessment processes. This misalignment highlights the need for a more developmentally appropriate approach to assessment in early education (refer to Figure 5.9).

The tension between a top-down approach to assessment and the need for a more play-based, developmentally appropriate approach creates an imbalance. Teachers feel pressure to gather evidence of written tasks for all learning areas, despite acknowledging the limitations of such tasks in accurately portraying learner progress. This is reflected in Figure 5.9.

Structural challenges such as inadequate funding and a lack of teaching assistants contribute to a tertiary contradiction. These challenges hinder the creation of an enriching learning environment and place additional burdens on the three Grade R teachers, impacting on their ability to provide individualised support and ultimately affecting the quality of early childhood education, as indicated in Figure 5.9.

Overall, the analysis reveals a complex interplay of tensions and contradictions within the educational context, highlighting the need for a more holistic and contextually responsive approach to teaching and assessment in early childhood education. Addressing these contradictions is crucial for promoting optimal learning experiences and supporting the holistic development of the learners at Windy Meadows.

5.5 ARRIVING AT THE GERM CELL

The aforementioned contradictions can be traced back to the fundamental principles of capitalism, where education is treated as a commodity rather than a fundamental right or a means for holistic development. In her writing on scholarship and the role of CHAT amid the global phenomenon of socio-economic and political turbulence, Stetsenko (2021, p. 5) insists that:

Every country and every state need to be examined for the role they play in global trends within the neoliberal capitalist expansion and its destructive dynamics that produce the excluded, the invisible, the semi-jobless, and the criminalized.

Moreover, (Stetsenko, 2021) challenges scholars affiliated with CHAT to critically examine their foundations and associations with systems of oppression such as colonialism, patriarchy, racism, and white supremacy. She highlights the need for

scholars to question assumptions and engage in nuanced explorations of these traditions' entanglements with oppressive systems.

With this in mind, reflection on the tension between play-based, child-centred approaches and institutional demands arises from the overarching goal of preparing learners to meet standardised requirements, reflecting the prioritisation of economic productivity over individual growth. The secondary contradiction, manifested in the over-reliance on rote learning and neglect of learners' inherent potential, underscores how the system values passive knowledge transfer over active engagement. This echoes capitalist ideologies that prioritise efficiency over creativity. Similarly, the misalignment between assessment tasks and developmental levels illustrates how institutional pressures prioritise quantifiable outcomes over developmentally appropriate practices, mirroring capitalism's emphasis on measurable results. Structural challenges such as inadequate funding further exacerbate these contradictions, as they impede efforts to create enriching learning environments and provide individualised support. This reinforces the notion of education as a commodity to be managed within budget constraints, rather than a fundamental right deserving of adequate resources. Ultimately, these contradictions underscore the need for a paradigm shift in education, one that prioritises holistic development and individual growth over market-driven objectives as echoed in scholarly works by many leaders in CHAT (Foot, 2014; Stetsenko, 2021; Vianna & STETSENKO, 2014).

The findings have significant implications for rethinking educational practices and policies within the framework of capitalism. They highlight the pervasive contradictions arising from treating education as a commodity, which prioritises economic productivity and standardised requirements over holistic development and individual growth. This approach leads to an over-reliance on rote learning, neglecting learners' inherent potential and favouring passive knowledge transfer over active engagement. The misalignment between assessment tasks and developmental levels, along with structural challenges like inadequate funding, further exacerbates these issues by reinforcing the commodification of education. In doing so, the learner's rights to learn through play are violated. These insights call for a paradigm shift that values education as a fundamental right and emphasises holistic development, creativity, and individual growth. Such a shift would require critical examination and dismantling of oppressive systems intertwined with

educational practices, aligning with calls from CHAT scholars for a more equitable and human-centred approach to education.

5.6 THEME 3: TEACHERS' OPENNESS TO A PLAY-BASED MODEL

This final theme provides an analysis of how the idea of adopting a sociocultural model of play-based teaching of emergent mathematics was presented, workshopped, and embraced by the three Grade R teachers at Windy Meadows. The theme answers the research question by describing how, when gently confronted with their practices in an iterative interview process, the three teachers at Windy Meadows began to acknowledge the limitations of adhering too much to a scripted, assessment-oriented daily programme.

This conscious awareness was evident in the linguistic cues given by the teachers, and specifically in how they identified shortcomings and offered suggestions during the focus group sessions. The analysis describes how the teachers became more sensitive to how their practices had the potential for tapping into the learners' lived experiences and each learner's motive for learning by promoting more learner-centred activities. The teachers were now leading the discussion for change, thereby mirroring, as underpinned in the theory of the ZPD, the concept of the gradual withdrawal of the MKO. Through this process, the contradictions and tensions were summarised and consequently, the subjects' voices were prioritised and given the attention that might not have otherwise been considered.

5.6.1 Dialectic Iterations

In this sub-theme, the analysis details how the sociocultural model began to emerge as an outcome of the focus group meetings. Specific outcomes of the focus group are described using the CHAT framework, against them proving answers to the research question. Aligning with the nature of CHAT as a model for analysis and intervention, the outcome of this study (that is, describing what a play-based pedagogy of mathematics education could look like) was constantly evolving, as each contradiction that was overcome was subsequently replaced by other tensions.

Through contemplative iterations in the focus group discussions, the observed and expressed tensions were shared, discussed, and confirmed with the three teachers. They displayed a transformative mindset of incrementally moving towards a position where

play-based learning and assessment became one. At the same time, the constraints of a schooling system that requires evidence of learning were acknowledged. As described in Chapter 4, the timing of the discussions was arranged so that they were a few weeks apart so that the teachers had time to reflect on the discussions, observe their practices, and importantly, ensure that they did not feel too pressurised to commit to change under duress.

5.6.2 Iteration 1

The first focus group meeting was not ideal as circumstances on the day resulted in the focus group needing to meet together in the classroom used by Teacher S one afternoon after the official school day was over. Although many learners go home when the class is dismissed, there are at least 20 learners who wait for their siblings and gather in one of the three teacher's classrooms where they are usually provided with some additional support in the form of simple worksheets or colouring exercises. On the day of the meeting, the learners were asked to "nap" and rested on their arms at their tables, with a few learners resting on the mat, some falling asleep quite easily despite the speaking and comings and goings. Despite the learners being in the classroom, the meeting nevertheless went ahead. The initial findings were gently revealed and elaborated on, from quite general observations to more specific ones, as guided by the protocols outlined by Cohen et al. (1993) in Chapter 4.

It was unfortunate that for that day's focus group, the three teachers had to speak in whispers, as the learners were resting, and the teachers did not want to disturb them. This resulted in the discussion assuming a somewhat passive nature. The three teachers seemed quite nervous, and to counter this, they were given reassurance by emphasis being placed on the importance of their work and how valued they were as co-constructors in the ongoing refinement of praxis.

As a starting point, the conversation focused on a few assessment activities, with the motive of learning through play as a priority. The researcher remained sensitive to the observed hierarchy at Windy Meadows, and to pre-empt the possible concern that the teachers might be harbouring about making radical changes was addressed at the outset. The researcher suggested to the teachers that before making any adjustments to their assessment and reporting processes, the researcher would send an email and hold a

meeting with the principal to present the initial findings, recommendations, and implementation plans. This suggestion was well received, and, additionally, when approached, Principal A was happy with the proposed plan. According to her, their recent Grade 3 mathematics results from DBE systemic tests were poor, which she felt had been quite unfair given the COVID-19 pandemic and she felt eager to improve their current status and was therefore open to support.

5.6.3 Iteration 2

In the second focus group meeting, the discussion concentrated on looking at the mathematics assessment tasks and how they could be adjusted to be less paper-based and more play-based instead. There were some noticeable shifts in thinking from the initial meetings, and it was evident that the previous meetings had sparked awareness among the three teachers of thinking more critically about the tasks that had been set. Specifically, they had more awareness about how these tasks informed them of each of the learner's actual abilities. These shifts were presented as linguistic clues (refer to Table 5.2) that evidenced the teachers' reflection and action towards more suitable methods. Teacher A remarked on the "adding 1 ladybird" task, stating how they had recently discussed this task with each other. The teacher referred to how "adding 1" would be confusing as the learner would see 2 and automatically assume that, based on their understanding, they would need to draw 2. Adding to what Teacher A had said, Teacher M referred to this as being "a bit of an oopsy", meaning an oversight on their part. What she was signifying was that the learners bring their prior, everyday knowledge with them, although not in these words, and that as teachers, they should work with this knowledge to bridge the divide between the everyday and schooled/scientific knowledge.

This led to the beginning of a creative process in which the three teachers embraced the suggestions and showed a keen interest in genuine improvement, showing considered reflection on the points raised in the focus group discussions. These discussions were initially uncomfortable to manage, as it took time for the three teachers to speak freely and open up. As mentioned earlier, they seemed more at ease in the individual meetings. However, with time, they realised that there was no threat of them being forced to change anything that either did not make sense to them or that they were not comfortable with. Importantly, there was no "gold standard" that they were having to adhere to. Ideas were brainstormed and there was constructive debate. For example, Teacher A suggested that perhaps they incorporate

more photographing of the learners and Teacher M interjected by saying that they did not have the budget for printing, stating: “Should we then pay out of our own pockets?” Teacher A also mentioned the POPIA³⁰ Act and said that they would have to be careful not to infringe any laws.

After engaging in active listening without providing immediate solutions, the suggestion was made to the three teachers to continue with their daily routines and try to allocate time for contemplation. They were encouraged to note down any changes, improvements, or resultant disturbances that occurred to them while implementing small changes. This approach resonates with the dynamics of activity systems, where altering one contradiction often gives rise to new ones, leading to a shift in the overall system (Vianna & STETSENKO, 2014)(refer to Table 5.2 for emerging contradictions, with the associated linguistic clues guiding the textual analysis). Engaging in active listening, encouraging contemplation, and noting down ideas were beginning to reap benefits, encompassing personal growth, creativity, problem-solving, and the dynamics of the Grade R activity systems. By engaging in these strategies, the teachers practised reflection, innovation, and adaptability, ultimately enhancing their capacity to navigate complex challenges and achieve their goals.

Table 5.2: Textual Analysis

Emerging Tensions	Themes	Linguistic Clues from Teachers
Loss of Agency	Management and Planning Theme 1	“in the end, we just do it ... manage”
Depth of Content Knowledge	Working with Mathematical Concepts Theme 1	“That was a bit of an oopsy!” “We leave them with a bit of confusion”
Incorporating everyday knowledge with scientific (schooled) concepts	Uptake of Mathematical Concepts Theme 1	“So now we say draw only 1 spot ... but I am seeing 2 ... that is what we are talking about ... we

³⁰ Protection of Personal Information Act (often called the POPI Act or POPIA)

		actually had a discussion this week.”
Loss of culture and meaning-making	Language and Cognition Theme 1 & 2	“Today is ... two thousand and twenty-two” (2022)
Separation of assessment and learning activities	Assessment Constraints and Limitations Theme 1 & 2	“Then sometimes I tell myself at the same time, it’s Grade R they are supposed to hear to learn, how can we be judging the child, it’s wrong so I give the child full mark?” “Where in the day do we find the time to do this, cos at the end of the day we all have our own family and responsibilities!”
Commoditisation of Education	Structural Challenges Theme 2	“Sometimes there is no time to go to the bathroom.” “Anything I have to do must be done before school starts.” “Library is locked because otherwise, they steal.”

5.6.4 Iteration 3

This iteration of the focus groups describes the teachers’ awakening of their understanding of the transformative nature of a play-based model through the process of active co-construction. By providing examples of linguistic narratives, the analysis demonstrates a noteworthy shift towards more learner-centred approaches to teaching and assessment where the two entities are not polarised but rather are working together to maximise opportunities for the teaching of emergent mathematics through play.

On commencing with the third iteration, Teacher M volunteered information about some of the changes for the Term 2 assessments that they had discussed during the time between meetings 2 and 3. Significantly, they had decided to rework the rubric and move away from a mark to rather a comment and have more teacher input about the assessment tasks, for example, if they know that the child is capable in an area, then they would have the last say and override the final comment. Teacher M observed:

The marking is not formal anymore and it is now not based on Codes 1–7. It is now also ... the instruction and the rubric are based now so that your opinion as the teacher makes, helps the mark. This is now just because ... maybe the child didn't complete um the thing correctly ... Just because the activity is wrong doesn't mean that the child isn't able to ...

Teacher A [interrupts]: “The child can speak to you and maybe not able to do on paper but through verbal conversation is able to understand.”

In CHAT, understanding the historical and cultural context is essential to comprehending current activities and practices. Within the analytical framework of CHAT, it was evident that, including the process of deep discussion into the three teachers' past experiences was shaping them to becoming teachers. They were able to locate the “here and now” by looking at their history, an essential element associated with CHAT (Vianna & Stetsenko, 2014). The teachers were beginning to understand and situate their current teaching practices in the context of their own past experiences, as well as those of their learners. The analysis suggests that through discussion and reflection on their practice, the teachers gained insight into their present teaching practices, thus aligning with the principles of CHAT. Stetsenko (2021) strongly advocates for the need to challenge the status quo actively and on an ongoing basis, to create better futures for society.

Strongly linked with CHAT is the occurrence of expansive learning mindset shifts, whereby as contradictions are ignited, individual stakeholders begin to question and depart from established practices (Engeström, 2001). By the very nature of critical reflection and open discussion, these qualitative transformations form the epicentre of sociocultural transformation. Through mediated discourse in the ZPD, past, present, and future activities can be explored. According to Engeström (1987, p. 174), “It is the distance between the present everyday actions of the individual and the historically new

form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in everyday actions.”

CHAT serves as a valuable analytical framework for examining linguistic cues, such as Teacher M’s use of phrases like “your opinion as the teacher makes, helps the mark”, which implies a less formal, evidence-based assessment approach. This power shift, where teachers acknowledge their input as valuable and essential for the learners’ benefit, is particularly significant.

The shift from a formal coding-based marking system to one where teachers’ guidance and rubrics are key suggests a more adaptable and potentially child-centred evaluation approach. Teacher A interrupted, stating: “The child is able to speak to you and maybe not able to do on paper but through verbal conversation is able to understand.”

This reflects a positive outlook on learners’ capabilities, highlighting that proficiency can manifest in diverse forms beyond traditional written assessments.

Additionally, textual analysis of the transcripts identified encouraging examples of language phrases that convey a heightened sense of understanding and empathy. Teacher A continued: “Maybe the child didn’t complete the thing correctly, just because the activity is wrong doesn’t mean that the child isn’t able to ...”

It implies a focus on the learning process rather than just the result. There was an expressed acknowledgement of individual differences with an emphasis on a child’s ability to understand through verbal conversation, even if they struggle with paper-based tasks.

It appeared that the activity system was transforming, as (albeit through minor shifts) it was evident that the teachers were moving towards a more learner-centred model where assessment is more formative, not based on a summative task. More importantly, it was not merely reducing the learner to a mark which could create a long-term stigma often hard to overcome.

5.6.5 Piloting and Feedback

In this sub-theme, the analysis describes the teacher feedback after the iterative processes of piloting this model; this took months of exchanges, with waxing and waning momentum owing to the teachers’ full teaching loads. Delays were exacerbated by the

lack of flexibility and autonomy in managing their schedules, as described in earlier sections. The extended amount of time in the classrooms allowed participants to become accustomed to the researcher's presence, eventually leading to more natural behaviour that blended into the class setting. This minimised the perceived importance of the observation process and avoided drawing attention to the fact that specific behaviours were under scrutiny (Sedgwick & Greenwood, 2015).

In the final interview almost a year later, the teachers reflected on the year, including some of the changes that they had been implementing since the previous focus group meeting. This was especially relevant, given that there had been five months for the teachers to implement the changes. They explained changes to the assessments, describing them as less formal and more focused on real-life experiences.

Teacher A observed:

I think it's kind of. Not based too formal. Where the marking is concerned ... it also gives space for you as a teacher to like maybe you know that the child might be able to do it concretely but maybe not on the worksheet. So um you as the teacher. Can give your own input.

Additionally, their marking was no longer based strictly on a rubric. This allowed them to provide their input, and the activities now formed the assessments with more concrete, hands-on activities as opposed to a worksheet after the activity. The sentiments they expressed indicated that the teachers were beginning to feel more confident in their approach to assessments, and on several occasions they also indicated that their HOD was supportive of the changes. The class sizes of the three Grade R classes remained the same as the previous year and importantly, the three teachers reported having no names on the intervention register (as opposed to in previous years when, as they noted, there had been several names). This emphasises that they felt better about this, as they realised how important it was to allow learners to progress at their own pace given their ages and diverse backgrounds.

They spoke with a newfound confidence, saying how these recent changes in assessing everyday knowledge have led to a more open-minded approach and a focus on the individual strengths of each child. Teacher M stated:

But it's like we've always been doing concrete, but now this year our emphasis is even more on concrete. For example, with that spatial assessment. the symmetry one we are doing where we also doing the physical, we're also doing the concrete. The physical like ... Is the child able to do this?

In the context of the CHAT framework, Engeström et al. (1996) speak of the limitations of preconceived design processes when working with participants. They examined tensions using the adapted mediational triangle. Through this analysis, they found that, in some design processes, the artefacts become frustrating to the users, owing to the limitations of the artefacts in realising the users' motives. Rather than facilitating growth, they, conversely, prohibited growth and limited the realisation of goals . In the case of the present study, the three participant teachers at Windy Meadows began to realise that there were limitations to their assessment processes (using assessments and rubrics) and consequently, they began to shift their design of assessments to align them more with realistic outcomes of what potential the learners displayed as opposed to what they were lacking.

Similarly, in the focus group meeting conversations, the researcher could hear that the teachers had begun to recognise the value of allowing the learners to play more freely with concrete objects; they thereby got closer to embodying instrumental genesis. This occurs when the user understands how to use an artefact to serve its purpose, and in doing so, the artefact becomes an instrument and creative processes are awakened through action. Individuals acquire the use of tools (and internalise this meaning) through social interaction and cultural learning, and this in turn leads to the development of higher mental functions (Vygotsky & Cole, 1978).

The language barriers and cultural differences were reported as ongoing challenges, but the teachers spoke with conviction about how they would strive to help every learner progress. The teachers added that they would advise newly qualified teachers to get to know each child as an individual and not judge them based on preconceptions. The following text conveys a message of inclusivity, empathy, and the importance of understanding. The message highlights the shift towards a more critical approach that considers the holistic development of every learner, regardless of their background or perceived limitations. Teacher A remarked:

Yes, especially as based on the diversity of South Africa. We must not label all our children. Even children can be judged. Things can be seen as a barrier. But it's not actually a barrier they have. When you get to know the child, then you can actually see. How do I say? It's just something that sticks to me. Like language is seen as a barrier. For example, there are different types of barriers. As the educator should not see that as the child is not able to do it. You should just see that as taking how to help the child to improve. See it is work in progress.

The analysis explores the teacher feedback following extensive iterative processes in piloting a new model, which endured challenges owing to the teachers' heavy teaching loads and limited autonomy over their schedules. The prolonged presence of the researcher in classroom, allowed for more natural behaviour where the researcher was part of the process, not merely an observer. The three teachers reflected on modifications made over five months when being left to try out the changes, particularly in assessments, resulting in a conscious effort to make assessments less formal and more experiential. The shift from rigid rubrics to hands-on activities indicated increased teacher confidence and support from higher-ups. Teachers had recognised limitations in their assessment processes, particularly those encouraging unrealistic outcomes and too much focus on learning deficits. They embraced a more learner-centred, play-based approach, aligning with CHAT. Despite ongoing challenges such as language barriers, the three teachers advocated for more individualised support and a holistic approach to learner progress, promoting inclusivity in education. This narrative underscores the importance of continual reflection and adaptation in education, prioritising the diverse needs and potential of every learner. Importantly, it also underscores the justification for teachers to question the status quo of their practice, thereby ensuring critical reflection on the communities that they serve.

5.7 SUMMARY

This chapter of analysis provided a comprehensive examination of the transformative journey undertaken by the three Windy Meadows Grade R teachers. This involved them moving towards a more learner-centred approach, specifically through the adoption of a sociocultural, play-based model. The narrative captured the shifts in teaching practices, assessment methodologies, and the teachers' attitudes over time. In the thematic breakdowns (Theme 1, Theme 2, and Theme 3), the analysis provided a structured and

coherent overview of the study's progression, examining specific aspects such as the teachers' initial practices, challenges, and potentialities of play-based pedagogy, and the responses to the proposed shift. Each theme contributed to a comprehensive understanding of the transformative process.

Theme 1 focused on the practices of the Grade R teachers in teaching mathematics. It examined their planning and delivery of lessons, as well as their beliefs about diversity and teaching in diverse classrooms. The analysis suggested there was a tendency for the teachers to view knowledge as something passive, resulting in an over-reliance on rote techniques and a lack of active engagement. The teachers also focused heavily on teaching in English but did not provide opportunities for unstructured interaction in the learners' mother tongues. A tension between preserving cultural identity and the pressure to achieve English language proficiency was uncovered.

In Theme 2, the analysis focused on the challenges and potentialities of play-based pedagogy in teaching Grade R mathematics. The challenges included assessment constraints and limitations, such as the pressure to provide evidence of assessment practices and the mismatch between the assessments and mathematical understanding. The assessments often focused on skills like decorating and colouring, rather than assessing mathematical concepts. The teachers recognised the limitations of the current assessment processes and were open to more child-centred alternatives. However, they were constrained by top-down pressure and unrealistic assessment expectations; they recognised the need for support and transformation to better serve their learners.

In the final theme, the analysis discussed how the three teachers responded to the idea of shifting to a sociocultural, play-based model of teaching. The analysis explored the individual and group responses, as well as the tensions and contradictions that emerged. The teachers showed a willingness to improve and explore new approaches but also expressed concerns about practical constraints and the commoditisation of education. The theme concluded with notable shifts towards a play-based model that requires active co-construction and ongoing reflection to create a more learner-centred approach to teaching and assessment. The feedback from the teachers indicated that they felt more confident in their approach and recognised the importance of allowing learners to progress at their own pace. They emphasised the value of getting to know each child as an individual and the challenges of overcoming barriers as opportunities for growth.

This chapter strived to meet the research objectives by studying the viewpoints of three teachers, exposing the constraints inherent in balancing the promotion of life competencies and fostering social development through play. This is against the conventional focus on preparing learners to adhere to the requirements of the education system. Moreover, the analysis underscored the limitations within the activity system, exacerbated by challenges stemming from linguistic instruction and socio-economic factors, resulting in disturbances within the activity system itself. In the following (final) chapter, the discussion summarises the study and provides answers to the research questions, as well as insights and implications.

CHAPTER 6

DISCUSSION

6.1 INTRODUCTION

In the previous chapter, the analysis of data and findings were presented. This final chapter serves as the culminating segment of this study and is organised into seven engaging sections. It begins with a comprehensive summary, providing a reflective review of each chapter, and spotlighting the key themes, methodologies, and outcomes.

The discussion in this chapter consists of an in-depth discussion of the findings in relation to the literature review and theoretical framework, critically examining how the study's results align with or challenge existing knowledge in the field. This exploration illuminates the unique contributions of the study, offering fresh perspectives on the topic.

Following this, the findings are meticulously positioned against the research questions, determining the extent to which these questions have been answered and identifying any additional enquiries that have surfaced. This analysis ensures a thorough understanding of the study's impact and implications.

The chapter concludes with a presentation of new insights and recommendations stemming from the study. This section uncovers novel discoveries revealed during the research, suggesting exciting possibilities for future investigations. Practical applications of these insights are also discussed, providing valuable guidance for teachers and researchers looking to implement a play-based model of teaching emergent mathematics in diverse Grade R classrooms.

Overall, this final chapter not only encapsulates the essence of the study but also opens new avenues for continued exploration and practical implementation, marking a significant contribution to the field of educational research.

6.2 MAPPING THE JOURNEY

“The scientific mind, on the contrary, views revolution as the locomotive of history forging ahead at full speed, it regards the revolutionary epoch as a tangible, living embodiment of history” (Sannino & Engeström, 2018, p. 45).

The latter authors' main approach is to provide a conscientious view of how activity theory impacts and shapes both interventions and research. They describe CHAT as a paradigm in which the constantly evolving object cannot be delineated or fully grasped. This is owing to unique and individual past histories manifesting in current practices. They argue that this change is a constant process, not a "quick fix" approach and suggest engagement and sometimes "uncomfortable" attention is needed to transform and emancipate ourselves. This argument also demonstrates the duality of CHAT, whereby the theoretical and methodological aspects work in tandem; this provided a cohesive, tangible, and dynamic framework throughout this study.

Likewise, the previous chapter's analysis presented a thorough examination of the transformative journey undertaken by the three Grade R teachers as they shifted towards a more learner-centred approach, adopting a sociocultural, play-based model. The narrative captures the evolution in their teaching practices, assessment methodologies, and attitudes, structured across three thematic breakdowns. The chapter effectively met the research objectives by providing insights into the perspectives of three teachers, revealing the inherent constraints in balancing the promotion of life competencies and social development through play with the conventional demands of the education system. It also highlighted systemic limitations – particularly those related to linguistic instruction and socio-economic factors – that contribute to disturbances within the activity system.

In Chapter 1, the foundation of the study was established, starting with the introduction of the research background. This led to the articulation of the research problem and the study's primary aim: to explore a play-based model for teaching emergent mathematics in diverse Grade R classrooms. Following this, the chapter outlined the research questions that serve as the cornerstone of the study. An overview of relevant literature was provided, offering valuable insights into the topic and situating the study within the broader academic discourse. Additionally, the chapter detailed the theoretical framework and research methodologies, offering a comprehensive picture of the study's structure and approach.

Chapter 2 provided a thorough examination of both local and international literature on play-based learning and emergent mathematics. This exploration helped to contextualise the research, explaining how it contributes to and fits within the broader field of education

research. The literature review also critically assessed previous studies, identifying existing gaps and highlighting areas that the current study has aimed to address.

In Chapter 3, attention was turned to the theoretical framework guiding the analysis, namely Vygotsky's CHAT. This chapter explored key elements of CHAT, such as internalisation, the general genetic law, mediation, the ZPD, the role of language, the germ cell, the activity system, and inherent contradictions. By examining these concepts, the chapter provided a solid theoretical foundation for understanding the study's analytical approach.

Chapter 4 focused on the detailed methodology of the study. It described the research design and explained why it was appropriate for the study's objectives. The chapter also covered the research site, participant sampling methods, data collection techniques, and data analysis strategies, including the use of a thematic approach. The research plan was discussed, emphasising its iterative and non-linear nature, which required revisiting and adjusting as the research progressed. Highlighting the dual role of CHAT was particularly important – not only as a theoretical framework but also as an analytical tool through the activity system, which was used to understand and identify contradictions found during the study. In line with BERA (2018), the chapter concluded with a discussion of the ethical procedures guiding the research.

Chapter 5, the heart of the study, presented the analysis of the findings. Grounded in the theoretical framework of CHAT, this chapter guided the process of answering the research questions. The data was organised into three main themes, each encompassing several sub-themes that highlighted specific findings. This thematic presentation of data provided a clear and structured analysis, allowing for a deeper understanding of the teachers' transformative journey towards a play-based, learner-centred approach to teaching emergent mathematics in Grade R classrooms.

6.3 ALIGNING FINDINGS WITH EXISTING KNOWLEDGE

In this section, the discussion centred around comparing the findings with current literature on play-based learning and emergent mathematics to ascertain what gaps remain, and also to identify possible new emerging insights. Of importance, and in keeping with the CHAT paradigm, the discussion also identifies and describes the silences in the data in relation to existing literature.

The findings discussed in Chapter 5 highlight a significant discrepancy between the three Grade R teachers' practices and the principles of emergent mathematics pedagogy as depicted in the existing literature including policy (CAPS). This underscores the importance of play. These discrepancies were revealed in actions and words and were also further illuminated in the tensions expressed as dilemmas and double binds. They had seemed trapped by knowing “what they ought to be doing” and “what they needed to do” to justify the work and progress being made in preparing the learners for the formal demands of Grade 1. They were overcompensating with assessment tasks – doing far more than the requirements in CAPS. This was happening in spite of them complaining about the number of administrative tasks they were required to do. One has to ask the question of why they were so determined to have so much evidence at their disposal.

This determination shown by the participants suggests the silences in the literature relate to coping mechanisms adopted by teachers in the teaching of emergent mathematics. These mechanisms result in them teaching to provide evidence to stakeholders to whom they feel accountable, when in fact the sole stakeholders should be the learners and the evidence of how (with guidance from the teacher) they can play and learn.

The analysis identifies several secondary contradictions stemming from the primary contradiction of assessment-driven practices. Teachers were observed prioritising the completion of weekly tasks as evidence of assessment processes, thereby constraining the spontaneity of dialogue and limiting opportunities for free play and choice – a departure from the fundamental tenets of play-based pedagogy.

Despite these constraints, instances of construction play with wooden blocks emerged as notable exceptions. On these occasions, learners engaged in creative processes, demonstrating emergent mathematical thinking without the imposition of traditional assessments. For example, a dialogue between two learners constructing cars and counting numbers exemplified how play activities could align with mathematical concepts organically, without the need for external assessments.

When comparing these findings with existing literature on emergent mathematics, it becomes evident that, while the teachers may have adhered to assessment-driven positivist practices, there were instances where the principles of play-based pedagogy shone through. These findings underscore the importance of reconciling educational

practices with the principles of emergent mathematics, emphasising and actively promoting the value of spontaneous dialogue, free play, and creative exploration in fostering mathematical understanding among young learners. The value of CHAT must be highlighted, as both the discrepancies and instances of play-based learning were identified with the help of this supportive theoretical framework. This unique model is still quite underexplored in South African educational spheres and has great potential to be used as a powerful collaborative tool to enhance understanding and bring about progress in teaching and learning.

6.4 FINDINGS IN DIALOGUE WITH THE THEORETICAL FRAMEWORK

The sociocultural framework of CHAT supported the analysis in this study by providing the framework of the activity system as a unit for analysis. The activity system provided the mechanism to study the interactions and interdependencies among the various components such as the subject (the individual teacher and group of teachers), object (goal of teaching mathematics using play), and division of labour (how the roles and hierarchy were structured). Tools, rules, and community were further inserted into the activity system to add greater depth of connecting elements forming part of the unit of analysis. This holistic perspective provided a comprehensive understanding of the nature of emergent mathematics and how (and the extent to which) this was being achieved through play. Moreover, the activity system revealed tensions presented as contradictions, dilemmas, and conflicts; these tensions provided the catalysts for change and advancement towards more play-based practices within diverse contexts.

CHAT emphasises the importance of context in shaping human activities and this helped guide the analysis of the interviews and focus group meetings. By analysing the activity system, researchers can explore how cultural, social, historical, and institutional factors influence the studied activity. This contextual analysis helped in understanding the challenges and complexities of play-based teaching in such diverse contexts.

First, the primary contradiction observed in the study – between assessment-driven practices and the principles of emergent mathematics pedagogy – can be analysed within the context of CHAT. The prioritisation of completing weekly tasks for assessment purposes reflects the influence of external factors such as institutional requirements and expectations. These external demands create tensions within the activity system of the

classroom, leading to secondary and tertiary contradictions such as limited opportunities for spontaneous dialogue and free play.

Second, the instances of construction play with wooden blocks represent a form of activity that transcends the constraints imposed by assessment-driven practices. Within these moments of play, learners engage in creative processes and demonstrate emergent mathematical thinking. This aligns with CHAT's emphasis on the role of cultural tools (such as play materials) in mediating learning experiences and promoting the development of higher mental functions.

Furthermore, the dialogue between learners during construction play illustrates how social interactions within the activity system can scaffold mathematical learning. As learners collaboratively engage in play activities, they negotiate meanings and co-construct knowledge, demonstrating the social nature of learning emphasised by CHAT.

The observed shift towards a more formative approach to assessment signifies a transformation in the activity system within the classroom. In doing so, the object of activity was shifting as the teachers revisited the nature of their teaching practice as well as the motives behind them. CHAT emphasises the dynamic nature of activity systems and the potential for change over time, highlighting the adaptability and responsiveness of educational practices to evolving needs and contexts.

According to CHAT, learning occurs through social interactions and collaboration, with individuals actively participating in the co-construction of knowledge. Teachers play a crucial role in facilitating these interactions and adapting educational practices to fit the sociocultural contexts of their learners.

When viewed through the theoretical framework of CHAT, the findings underscore the complex interplay between cultural, social, and individual factors in shaping educational practices. This highlights the need not only to consider the explicit goals and constraints within educational settings but also the broader sociocultural context in which learning takes place.

The concept of the germ cell in CHAT was covered extensively in the theoretical framework and is critical for understanding and analysing the development of complex systems and activities such as those presented in the study at Windy Meadows. The germ cell is a simple fundamental unit or core idea from which the complexity of an activity

system can be developed and understood. This germ cell embodies the essential dynamics and contradictions of the activity system. Once the germ cell is identified, it is used to model and understand the development and expansion of the activity system. This involves exploring how the germ cell can grow and transform to produce the complexity seen in the full activity system. The germ cell helps in understanding how learning and development occur within educational settings and, by focusing on the fundamental aspects of a learning activity, teachers can design interventions that facilitate deeper understanding and growth.

The process of designing effective interventions that foster transformation was mirrored by the interviews conducted as an intervention at Windy Meadows. This had the outcome of collaborative and negotiated growth among the teachers in understanding how to arrive at pedagogical approaches that are more play-based and learner-centred. This also highlights the dynamic understanding that arose from collaboration that could practically address educational problems. This was done using the germ cell to design teaching methods and curricula that aligned with the developmental needs of learners. In line with Engeström et al. (2012), this was achieved by descending from the abstract to the concrete. The findings emphasised that the three teachers were excessively focused on the term “concrete” without often reflecting on the “abstract idea” or the notion linked to the topic. When analysing the interviews, the question asked was, how can you effectively teach concrete concepts to learners without understanding or considering the abstract ideas they represent?

Both elements (that is, abstract and concrete) are essential and interdependent. When planning lessons, it is crucial to incorporate the germ cell concept and move from abstract ideas to more concrete applications. The teachers at Windy Meadows were often fixated on the term “concrete”, neglecting to reflect on the underlying abstract concepts. One question remains, namely, without (themselves) first understanding and considering the abstract ideas that concrete examples represent, how can educators effectively teach those concrete concepts to learners? In such a way, this discussion motivates that the abstract and concrete are interdependent and must be addressed together for meaningful learning to occur.

6.5 FINDINGS ADDRESSING THE RESEARCH QUESTIONS

In this section, the discussion reflects on each of the sub-questions guiding this study and culminates in the primary research questions being asked: How can a sociocultural model of play-based pedagogy facilitate mathematics teaching in diverse South African Grade R classrooms?

6.5.1 Sub-question 1: How do Grade R teachers use play in their teaching of mathematics and what role does play have in their conception of the reception year pedagogy, and why so?

Initially, the teachers at Windy Meadows neglected did not harness the power of play by actively observing their learners' interests and incorporating them into their lessons and planning. Consequently, the learning environment only allowed for limited engagement and had little relevance to the learners' lives. Additionally, the teachers did not incorporate play into their assessment practices, nor did they create an environment that encouraged exploration and discovery. This led to a lack of open-ended materials and opportunities for the learners to experiment with different mathematical concepts. There was, however, some evidence of learner-led play-based learning occurring in instances where the learners were provided with simple artefacts that they could use as they chose. Examples of this were the instances where learners engaged in construction play using wooden blocks where the learners demonstrated seamless engagement in creative processes using these blocks. These revealed emergent mathematical thinking, as illustrated by a dialogue between two learners making cars and counting numbers. The learners aligned their play with mathematical concepts without the need for traditional assessments.

The teachers' conception of play lacked depth: their initial conception was that play was not rigorous enough to support academic learning. At times, they spoke out about how they knew play was important; however, despite this recognition of the importance of play by the teachers, they nevertheless prioritised traditional teaching methods and assessment over play-based learning. They did this because they feared that play would not adequately prepare learners for future academic challenges. It was obvious that the three teachers felt pressure to cover a set assessment-laden curriculum within a limited time frame. There were concerns expressed about classroom management: specifically, about maintaining control of the classroom during play-based activities and most

certainly, the three teachers faced pressure from parents and their HOD to prioritise academic subjects over play-based learning.

In terms of self-regulation, Vygotsky believed that play fosters the development of self-regulatory functions (Vygotsky, 1978). These functions include the ability to control one's impulses, emotions, and behaviours in accordance with social expectations and rules. Through play, children learn to regulate their actions, follow rules, and coordinate their behaviour with that of their peers.

Vygotsky also emphasised the role of adults (such as parents and teachers) in scaffolding children's play experiences. Scaffolding involves providing support and guidance to help children engage in more complex forms of play and develop higher levels of self-regulation. Teachers can offer assistance, ask questions, provide options for self-expression, and model appropriate behaviour during play, which helps children internalise self-regulatory strategies.

Leong (2023), in discussion regarding the current relevance of Vygotsky's theories on child development, relays the importance of clarifying the concept of "preschool". This period marks the beginning of the structuring process, where cultural tools start to shape children's perceptions and influence cognitive processes like attention, memory, and thinking. Alongside these cognitive changes, social and emotional capacities also transform. As these capacities mature, preschool children progress from being reactive to their environment to becoming more self-directed and intentional in their behaviour. This transition is facilitated by self-regulatory processes like private speech and make-believe play, both of which are instrumental in the development of higher mental functions.

The discussion highlights several important implications for Grade R pedagogy. By incorporating play based on learners' interests, teachers can create a more engaging and relevant learning environment. Integrating play into assessment practices allows for a more holistic understanding of learners' abilities. An environment that encourages exploration and discovery fosters deeper understanding and creativity in mathematical concepts. Balancing traditional teaching methods with play-based learning can prepare learners academically, while also nurturing their creativity and self-regulation. Teachers need support in addressing external pressures from curriculum demands and stakeholders to prioritise play-based learning. Play is crucial for developing self-regulation skills

foundational for academic and social success. Teachers should act as facilitators, providing scaffolding to enhance the complexity and depth of play experiences, promoting higher cognitive and self-regulatory functions. Finally, understanding the role of cultural tools in shaping cognitive processes during preschool years is essential for effective early childhood education.

6.5.2 Sub-question 2: How can a sociocultural model of play be promoted and prioritised as an integral part of pedagogy for the teaching of mathematics in diverse Grade R classrooms?

The idea of play being more integral to their teaching was gradually introduced during conversations and in the interviews. Specific instances were drawn upon and spoken about; these demonstrated how much learning was taking place in their play. It was done in a relaxed manner, not forcing any ideas but rather providing the teachers with instances (that the teachers would otherwise have been unaware of) where play was working beautifully at enhancing learning. Rather than creating an expectation to produce play-based learning, it was more about creating awareness where they could draw from and tap into the learners' lived experiences exhibited through their play. This was done to create richer learning and assessment opportunities.

This change was not about imposing new expectations but was about creating an awareness among teachers of how play can enhance learning. The conversations and interviews helped to raise the awareness of the teachers that they were previously unaware of the learning that was taking place through play. This suggests that the teachers should be provided with moments to reflect on their teaching practices, where, as in this study, the three teachers were encouraged to be more aware of and responsive to the learning that is taking place through play.

Fleer (2023) found that children are motivated to learn mathematical concepts through imaginary play, describing how in a recent study with an imaginary play world set-up, teachers observed how play was a key social and developmental activity for children. The children were deeply engaged in solving play problems, often involving maps and directional arrows, to help characters in their imaginary world. As the play evolved, the teachers introduced new problems and challenges, such as navigating to different destinations and considering factors like the earth's rotation and the moon's orbit. These

problems led the children to use mathematical concepts, such as percentages and multiplication, to find solutions. The drama of the play situations drove the children's curiosity and need to learn. This study highlights the importance of recognising and nurturing children's natural wonderings, as well as the role of imaginative play in motivating learning. It also suggests that traditional enquiry-based learning approaches may lack the same level of drama and motivation found in play-based learning.

Sociodramatic play provides an ideal context for scaffolding children's learning within their ZPD, as adults and peers can offer support and guidance to help children engage in more complex play activities. Vygotsky viewed sociodramatic play as a key mechanism for children's cognitive, social, and linguistic development. Through imaginative play experiences, children not only explore their creativity and imagination but also develop important cognitive and social skills essential for their overall development (Vygotsky, 1978).

The findings suggest several implications for promoting and prioritising a sociocultural model of play in Grade R classrooms, particularly for teaching mathematics. First, raising teachers' awareness of the educational value of play is crucial. Teachers need to recognise that significant learning occurs through play, as demonstrated by the discussions and examples provided during the study. This awareness allows teachers to leverage play as a powerful tool for enhancing learning and creating richer assessment opportunities by tapping into the learners' lived experiences.

Second, the approach of integrating play should focus on encouraging reflection rather than imposing new expectations. Teachers should be given opportunities to reflect on their teaching practices and observe how play naturally supports learning. This reflection can help teachers become more responsive to the learning taking place during play activities, thus fostering a more supportive learning environment.

Third, as shown in Fleer's (2023) study, imaginative play can deeply motivate children to engage with mathematical concepts through problem-solving and exploration. This implies that play-based learning should be designed to include dramatic and immersive elements that drive curiosity and engagement, potentially making learning more effective than traditional enquiry-based methods.

Finally, adopting Vygotsky's concept of sociodramatic play as a framework for teaching can provide the necessary scaffolding for children's cognitive, social, and linguistic development. By participating in sociodramatic play, children can develop essential skills within their ZPD, supported by guidance from adults and peers. This method not only enhances creativity and imagination but also fosters important cognitive and social skills crucial for overall development.

Overall, promoting a sociocultural model of play in Grade R classrooms requires a shift in teachers' perceptions, the inclusion of reflective practices, the design of engaging and dramatic play scenarios, and the application of Vygotsky's theories to support children's holistic development.

6.5.3 Sub-question 3: How did the teachers respond to the theoretically informed, yet culturally relevant model for the pedagogy of Grade R learners in diverse sociocultural classrooms and how was this model introduced?

The three teachers were open to deliberations about diversity, particularly when engaged in discussions around the backgrounds of the learners and the diversity of languages that occurred within their classrooms. In the focus group meetings, they were initially less vocal about discussing some of the challenges presented by the diversity of their learners, whereas, in the individual meetings, they seemed to open up more easily. However, over time, they became more comfortable in the focus group meetings, and were able to articulate their experiences and suggestions. Certainly, all three teachers agreed that there were multiple challenges brought about by the diversity of learners, and added to this, there were socio-economic issues. These resulted in emotional and behavioural disorders that required specialised intervention which they felt, they were ill-equipped to deal with.

The teachers' initial hesitancy to discuss challenges suggests that they might have felt underprepared or unequipped to handle these. This implies a need for additional support and training for teachers to effectively manage diverse classrooms. The fact that the teachers became more comfortable and open over time indicates that ongoing professional development and a supportive environment can help teachers feel more confident in addressing diversity-related challenges. The mention of socio-economic issues leading to emotional and behavioural disorders highlights the need for teachers to

understand and address the broader socio-economic context that impacts learners' well-being and learning.

Through ongoing discussions regarding the observed instances of play, the teachers were provided with insight into the cultural relevance of play. As such, they were gradually introduced to the benefits of a sociocultural model of play which recognises and values the cultural experiences of all learners. Stetsenko and Ho (2015a) in exploring the role of play, demonstrate that while Vygotsky's theory explains how play can provide freedom from immediate situational constraints, Vygotsky did not address how children might also gain freedom from adult authority and broader societal norms. They add that critics of Vygotsky often suggest that he viewed human development as a seamless process of individuals blending into a society that is perceived as a unified whole, devoid of conflicts and contradictions. In contrast, Bakhtin argues that society is inherently marked by contradictions and disagreements. According to Bakhtin, dialogues and social interactions always involve struggles among different voices, values, and positions. Stetsenko and Ho (2015a) add that the idea of individual freedom and agency within a shared communal world, explored by both Vygotsky and Bakhtin, can be useful in understanding the close connection and mutual support between individual and collective levels of social practices. They suggest that an individual, engaged in play is both influenced by and contributes to collective history and social practices which are in constant motion and evolve beyond their current state.

The model of play-based learning is a work in progress, meaning that it is constantly evolving as the teachers undergo revelations from instances where play-based learning is beginning to reflect its value. Given the gentle probing and pushing towards more play-based teaching and learning, the three teachers were open and receptive to change as opposed to a top-down approach of enforcing rapid changes that are not brought about through understanding and discussion. The implication for this model is that of an ongoing mentorship that works in partnership with teachers to further identify opportunities for play-based learning that take into account the binding constraints and pressures that teachers are faced with when working in such diverse and demanding contexts.

The model described above, which emphasises ongoing mentorship and collaboration with teachers to identify and implement play-based learning opportunities, has strong

coherence that aligns with CHAT. Both models acknowledge the importance of social and cultural contexts in shaping learning and development. In CHAT, this is referred to in terms of the ZPD, which describes the difference between what a learner can do independently and what they can do with assistance (Cong-Lem, 2022). In the play-based learning model, ongoing collaboration with teachers is also emphasised as crucial to identify and implement learning opportunities.

In terms of CHAT, the sociocultural context of learning takes account of the influences stemming from cultural norms, tools, and practices (Hedegaard, 2009). In striving towards achieving the play-based learning model, the sociocultural must identify opportunities for play-based learning within diverse and demanding contexts as a standard (and ongoing) form of practice. Thus, this play-based learning model describes an ongoing process of evolution and adaptation as teachers undergo revelations and collaborate to implement play-based learning opportunities. In CHAT, the ZPD is seen as a dynamic and evolving concept (Hedegaard & Flear, 2009), and similarly, the proposed model has the same outlook, looking at moving forward constantly towards improvements that speak to the needs of the learners and their diverse contexts and challenges.

The findings from Sub-question 3 suggest several important implications for implementing a sociocultural model of play-based pedagogy in diverse Grade R classrooms. Initially, the teachers' hesitancy to discuss diversity-related challenges indicates a need for more comprehensive support and training to help them effectively manage these complexities. The fact that teachers became more open over time implies that ongoing professional development and a supportive environment can boost their confidence in addressing diversity-related issues.

The recognition of socio-economic factors leading to emotional and behavioural disorders among learners underscores the necessity for teachers to be equipped with strategies to address the broader socio-economic contexts impacting their students. This highlights the need for training that extends beyond traditional pedagogy to include socio-emotional learning and intervention strategies.

Ongoing discussions about the cultural relevance of play helped teachers understand the benefits of a sociocultural model of play, which values and integrates the cultural

experiences of all learners. This gradual introduction to play-based learning through reflective practices and supportive dialogue, suggests that change should be implemented through mentorship and collaboration rather than top-down mandates. This approach allows teachers to internalise and appreciate the value of play-based learning, leading to more sustainable and meaningful pedagogical shifts.

The evolving model of play-based learning aligns with CHAT, emphasising the importance of social and cultural contexts in shaping learning and development. This model underscores the role of mentorship in helping teachers identify and implement play-based learning opportunities, considering the constraints and pressures they face in diverse and demanding environments.

The findings emphasise that play-based learning should be seen as a dynamic, ongoing process of evolution and adaptation. By continually reflecting on and discussing their practices, teachers can better understand and integrate play-based learning into their classrooms, addressing the unique needs of their learners. This aligns with the CHAT perspective, where the ZPD is viewed as a dynamic and evolving concept, similar to the proposed play-based learning model. This approach ensures continuous improvement tailored to the learners' diverse contexts and challenges, fostering a more inclusive and effective educational environment.

6.5.4 Sub-question 4: What are the implications and the limitations of implementing a play-based model for teaching Mathematics in diverse backgrounds and what further research directions could benefit from both pedagogical and theoretical understanding of such an approach in Grade R classrooms?

According to Vygotsky, the impact of play on a child's development is immense. Vygotsky (1978) described how, in typical everyday scenarios, a child's behaviour contrasts with that exhibited during play. In play, action is guided by meaning, whereas in real-life situations, action typically takes precedence over meaning. He explained how play represents a fresh form of activity that releases the child from constraints. These constraints are rooted in the core act of consciousness, particularly evident in early childhood, where motives and perception are fused. He further explained how, at this stage, perception is not autonomous but rather a merged element of a motor reaction. Each perception serves as a catalyst for activity since the situation is conveyed psychologically

through perception. Given that perception is intertwined with motivational and motor activity, it is logical that consciousness (structured as such) constrains the child within the environment. However, in play, the commanding influence of external factors diminishes. The child might observe one thing but choose to act differently in response. This scenario marks a stage where the child starts to act autonomously, irrespective of what they perceive:

When the child enters into culture, he not only takes something from culture, assimilates something, and takes something from outside, but culture itself profoundly refines the natural state of behaviour of the child and alters completely anew the whole course of his development. (Vygotskiĭ, 1997, p. 223)

The implications of utilising the CHAT model in this context has the following implications:

- Through the implementation of the CHAT model of play-based learning, the theory and methodology are one and cannot be separated. In achieving this, the CHAT model pushes back against the fragmentation of learning where human experience and knowledge are treated as separate entities, often as a coping mechanism to provide evidence for institutional demands.
- CHAT allows for the realisation that knowledge cannot be separate from those who create it.
- Teachers can benefit from collaborative professional development and support in implementing a sociocultural model of play-based teaching. This can include training on cultural responsiveness, trauma-informed practices, and strategies for supporting learners with emotional and behavioural disorders.
- Play-based activities often encourage co-construction of knowledge and cooperation among children. This can foster a sense of community and understanding among learners from diverse backgrounds, helping to reduce stereotypes and biases.
- Play-based teaching allows for language-rich environments where children can practice and develop their language skills, including those who speak languages other than the dominant language of instruction. This supports the linguistic diversity of the classroom.

- Play allows children to express themselves in a safe and creative environment. Teachers can guide play activities to help children self-regulate, understand, and express their emotions, which can be particularly important for periods of crisis and change.
- Play-based learning involves activities that require problem-solving and decision-making. This can be empowering for children, particularly those who face challenges related to socio-economic factors. It can help them develop resilience and critical thinking skills.
- By using a sociocultural approach to play-based teaching, teachers can create an inclusive classroom environment that celebrates diversity and promotes respect for all learners, regardless of their background or abilities.
- By incorporating a sociocultural model of play, teachers can reconceptualise rote techniques into more learner-centred and Africanised forms of playful engagement where learners are encouraged and guided in mother-tongue instruction.
- Teachers require a specific style of mentorship which considers the situated historical and cultural context of the classrooms in which they teach. Mentors need to encourage discussions that engage teachers in the broader understanding of the cultural norms, values, and practices within diverse educational communities. In such a way, teachers can develop the confidence and skills to challenge the status quo within their contexts and through doing this, create better futures for their learners.

Implementing a play-based model for teaching mathematics in diverse backgrounds has several implications and limitations. Teachers can benefit greatly from professional development and collaborative support that focus on cultural responsiveness, trauma-informed practices, and strategies for supporting learners with emotional and behavioural crises. This approach fosters a sense of community and understanding among learners, reducing stereotypes and biases. Play-based teaching also creates language-rich environments, supporting linguistic diversity, and allowing children to practice and develop their language skills. Furthermore, play provides a safe and creative space for children to express themselves, aiding in emotional expression and self-regulation. The problem-solving and decision-making activities inherent in play-based learning empower

children, particularly those facing socio-economic challenges. Such activities also help develop resilience and critical thinking skills. Additionally, a sociocultural model of play fosters an inclusive classroom environment that celebrates diversity and promotes respect for all learners, regardless of their backgrounds. This model also encourages teachers to reconceptualise traditional teaching techniques into more learner-centred and culturally relevant forms of engagement.

However, limitations in the context of this study indicate the need for more adequate resources (particularly more hands-on help), ongoing teacher mentoring (including the allocation of time from reflection on practice), and a strong platform to promote Grade R as a unique year. The uniqueness of the year is important to emphasise, given that it forms part of schooling yet stands alone – resisting the confines of formal schooling in the latter years. Such mentoring is not to be taken lightly. Further, as demonstrated in Chapter 5, the mentoring should be open to the nature of problems since (as expected in any diverse society) these will be ongoing and varied. Many future problems encountered using a sociocultural model may need to deal with (and stick with) hard questions that require several re-visits and introspection on the part of the teacher and patience and non-judgemental guidance on the part of the mentor. Importantly, CHAT demonstrates that there are no universal solutions to problems. Also, the most effective solutions are usually implemented with gradual increments of change, and with time allowed for reflexivity.

Further research should focus on longitudinal studies to track long-term impacts, cultural adaptations of play-based models, development of new assessment methods, effective teacher training programmes, and the specific challenges and benefits in socio-economically disadvantaged areas. Addressing these implications and limitations through targeted research and support can enhance the implementation of a sociocultural model of play-based learning. This will improve educational experiences and outcomes for Grade R learners in diverse classrooms.

6.6 LIMITATIONS ARE STRENGTHS

In the interests of transparency, this section acknowledges that, in keeping with research studies, there is the need to recognise and delineate constraints that pertain to the validity, reliability, and transparency of any study. By openly discussing these constraints, it is

hoped to add integrity when applied in any field of research, while also providing valuable insights for future research directions.

Through a positivist lens, it may be construed that there are at least four limitations to this study. Beginning with the sample size, it could be argued that the sample size for the magnitude of this study was too small and this therefore limits the generalisability of the findings. However, in alignment with CHAT, the small sample size is appropriate and links to the CHAT paradigm, where every context is unique and brings its own history, rules, and influences. Additionally, the small sample size ensured that sufficient and quality time was spent in each Grade R class. Further, this allowed the researcher to get to know each of the three Grade R teachers well, thereby, adding richness and authenticity to the data collection and analysis.

Concerning the data collection procedures, it should be mentioned that the final focus group meetings relied solely on what the teachers reported and were not followed up with observations to substantiate their accounts. Here again, positivist paradigms require tangible evidence, even though in reality, records of assessment very rarely are indicative of actual performance and capability (Cohen et al., 1993).

The decision to refrain from requesting “evidence of change” was deliberate, so as not to appear to be sceptical of the teachers’ respective experiences. The irony in seeking proof while proposing changes that depart from evidence-based assessment lies in the tension between traditional forms of evidence and the need for alternative approaches to understanding teachers’ experiences. By acknowledging the limitations of traditional evidence and embracing alternative methods of data collection, researchers can navigate this tension and gain a more nuanced understanding of teachers’ perspectives. This suggests effort to respect and validate teachers’ perspectives, without immediately subjecting them to rigorous, traditional scrutiny.

Regarding video recordings of learners, it proved to be difficult to capture authentic moments as the learners tended to act differently when being filmed. As an advocate of play-based learning, the researcher acknowledges this bias and reflects on how this may have influenced the study design, data collection, or interpretation of results. This highlights a conflict between the desire for empirical validation and the recognition that

traditional forms of evidence may not fully capture the complexities of teachers' experiences.

The aforementioned points imply the need for the recognition of the inherent challenges and biases in educational research; to better understand and respect the experiences of teachers and learners calls for a thoughtful approach to navigating these issues.

6.7 RECOMMENDATIONS

In addressing the research questions guiding this study, the implications of the research were identified. Stemming from these implications, there is a powerful justification that further work should be done to promote CHAT's methodological tools in teacher education, particularly given the diverse contexts of our globalised world. This is necessary in order for teachers to be able to approach their learners with a more nuanced and richer understanding of human activity across different contexts. The following seven recommendations conclude the discussion in this study:

- 1) Institutions and educational authorities should prioritise providing teachers with ongoing professional development opportunities focused on implementing a sociocultural model of play-based teaching. This training should include modules on cultural responsiveness, trauma-informed practices, and strategies for supporting learners with emotional and psychological disorders given the turmoil that many learners face in our world today.
- 2) Schools should actively promote play-based activities in the curriculum, recognising their potential to foster collaboration, cooperation, and a sense of community among learners. Teachers should be encouraged to incorporate diverse play-based approaches that celebrate cultural and linguistic diversity without the fear of not having tangible outcomes and products to "prove their worth".
- 3) Ideally, learners should be taught in their mother tongue. However, given the challenges with so many languages, schools should provide resources and support for creating language-rich environments within classrooms, particularly for learners who speak languages other than the dominant language of instruction. This could involve training for teachers on language development strategies and access to multilingual resources.

4) Teachers should receive training that explicitly helps teachers recognise and identify cues that will support guiding play activities to help children self-regulate, understand, and express their emotions. This training should be tailored to address the needs of children with emotional and psychological disorders. This training should include play-based approaches that focus on creating safe and supportive environments for emotional expression.

5) Educational institutions should prioritise the inclusion of problem-solving and decision-making activities within the mathematics curriculum, particularly in play-based learning. Teachers should be supported in incorporating activities emergent mathematics activities that challenge learners to co-create games and tasks where they can think critically and develop resilience.

6) Schools should encourage teachers to adopt a sociocultural approach to play-based teaching, promoting inclusivity and respect for diversity. This can be achieved through professional development, curriculum support, and creating a school culture that celebrates diversity.

7) Mentorship programmes for teachers should be designed to consider the situated historical and cultural context of classrooms. Mentors should facilitate discussions that engage teachers in understanding and importantly, questioning the cultural norms, values, and practices within diverse educational communities, fostering partnerships over time.

By implementing these recommendations on an ongoing basis, educational institutions can actively support teachers in effectively implementing play-based teaching approaches that promote diversity, inclusivity, and learner well-being.

6.8 CONCLUSION

In the context of this study on play-based teaching of emergent mathematics in a diverse Grade R environment, the utilisation of CHAT underscores the importance of critically examining educational frameworks and methodologies for potential biases and oppressive elements. Typically representing the foundational stage of formal education, Grade R is a critical period where the groundwork for future learning is established. Incorporating play-based approaches to teaching mathematics during this stage is crucial,

particularly in diverse environments where learners come from varied sociocultural backgrounds.

By working with the elements of CHAT, teachers can analyse and understand the complex interactions between cultural, historical, and social factors that influence learning and teaching processes. This critical lens helps ensure that the play-based teaching of emergent mathematics does not inadvertently perpetuate colonialist, capitalist, racist, or supremacist ideologies. Instead, it prompts collaborative partnerships where teachers work together towards decolonising methodologies, centring marginalised voices, and fostering inclusive learning environments.

Decolonising methodologies involves recognising and challenging the dominance of Eurocentric perspectives in education and integrating diverse cultural knowledge and practices into the curriculum. By centring marginalised voices, teachers can ensure that the experiences and perspectives of all learners, particularly those from historically oppressed communities, are acknowledged and valued. This approach not only promotes a more inclusive learning environment but also empowers all learners to engage meaningfully with mathematical concepts, seeing their cultural identities reflected in their learning experiences.

Furthermore, fostering inclusive learning environments involves creating spaces where all learners feel valued, respected, and capable of contributing to the learning process. This includes using culturally responsive teaching practices that recognise and build upon the diverse cultural backgrounds of learners, thus enhancing their engagement and understanding of mathematical concepts.

Aligning with the broader goal of re-examining educational practices to promote equity and social justice, this approach contributes to the development of more effective and culturally responsive pedagogies in Grade R settings. By doing so, teachers can help bridge the gap between learners' home cultures and school experiences, making mathematics more accessible and relevant to all learners. Ultimately, this not only improves educational outcomes but also fosters a sense of belonging and empowerment among learners, preparing them for future academic success and active participation in a diverse society.

The journey for Grade R teachers has not been straightforward, mirroring the developmental trajectory of the Grade itself. Despite the recognised significance of play as a primary vehicle for learning, its absence within Grade R classrooms is conspicuous. This absence can be attributed to Grade R's integration into a formal educational system that prioritises tangible evidence of tasks and performance, leaving little room for the spontaneous, non-measurable nature of play.

The essence of play lies in its intrinsic value, its capacity to foster creativity, problem-solving, and social skills in children. However, these qualities defy conventional measurement and quantification, frustrating attempts to fit them into the standardised assessment frameworks imposed on Grade R.

To address this misalignment, Grade R teachers must assert their professional autonomy and resist the imposition of unsuitable assessments. Empowerment is key; teachers need to engage in collaborative processes where their perspectives are valued and integrated into educational practices. This collaborative approach entails a sustained effort, characterised by ongoing support, dialogue, and the gradual assimilation of new ideas. The process of collaboration is central to creating impactful change as, within a social-cultural model, once an activity which is a shared practice, the status of such practice has more chance of longevity than any outcome of individual activities (Cole & Engeström, 1993).

This bottom-up, collaborative model stands in stark contrast to top-down, quick fix approaches. It exemplifies a paradigm shift, where teachers and learners alike become active agents of change within their educational environments. By fostering a culture of empowerment and collaboration, Grade R teachers can reclaim the essence of play as a foundational element of early childhood education where children learn to play and play to learn.

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APPENDICES

APPENDIX A: PERMISSION LETTER WCED

Date: [inset]

Dear Western Cape Department of Education

Subject: Ethical Clearance Request

A Socio-Cultural Model of Play-Based Pedagogy for Mathematics in Diverse South-African Grade R Classrooms (PhD)

Ethics Approval Reference from University of Pretoria: [insert]

I am writing to apply for ethical clearance to conduct research in four Grade R classrooms in the Western Cape this year. My name is Rosemary Rushton (nee Brien) and I am a lecturer in Foundation Phase Mathematics at Cape Peninsula University of Technology. I am doing my PhD through the University of Pretoria, where my focus of study is on the pedagogy of play and Mathematics in teaching and learning. I aim to work with Grade R teachers who wish to enhance their skills and collaborate with me to develop a model that supports the promotion of Mathematics through play in diverse classroom contexts (A copy of the approved research proposal is attached).

This process, described as participatory action research will entail me working closely with the teachers for Term 1, Term 2 and Term 3 of 2022. It entails initial teacher interviews, class observations, follow-up interviews with suggested intervention and support, further follow-up observations and concluding interviews. The interviews and class observations will be recorded using Dictaphone Apps and video cameras. Additionally, workbooks and materials will be photographed, where need be (Copies of the interview questions and observation protocols are attached).

The teachers will not be required to deviate from guidelines stipulated in the CAPS Mathematics Document, but rather, receive theory-informed guidance through collaboration with me as to how best they can promote these skills through the use of play-based activities that reflect the diverse cultures in which they are situated. It must be stressed that the research will be *with* Grade R teachers, not *on* Grade R teachers. As a former teacher and someone familiar with class environments, particularly Grade R, I

intend to cause minimal disruption to the daily programme, and I ensure to only discuss activity during feedback sessions with the assurance that there will be no interruptions during teaching and learning.

The school and Grade R teacher will be allowed to select their pseudonyms, in keeping with the democratic nature of participatory action research and in doing so, ensure that the participants feel a sense of trust and autonomy in the process. The learner's identities will be protected, and all faces will not be revealed or disclosed in the writing up of this study. The video camera will focus on the and/or the board throughout and any incidental images of learners will not be seen by anyone else or used for research without further explicit permission. The teachers will be consulted at each stage of the process and the findings from all data will need to be presented with consent from the respective teachers.

All information will be password-protected and visible only to the supervisors and researcher. All data collected will only be used for academic purposes. At the end of the study, all the data will be securely stored in the archives at the University of Pretoria. The participants may ask questions before or during the time of their participation. If they have any concerns regarding the data collection procedures, they may notify me or my supervisors.

I would also like to request permission to use the data, confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis using the data for research purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

To avoid the spread of the virus due to the COVID-19 pandemic and achieve anonymity, the interviews will be conducted as an online text-based interview. For the observations, all COVID protocols will be adhered to in line with the national guidelines and the University of Johannesburg guidelines. Please note that since this is a voluntary participation, there will be no reward or monetary payments to any participant.

Should the teachers wish to withdraw from the study, they may do so at any point and are also welcome to ask for more information should they not understand any process or require further details.

Thank you for your time and attention. I look forward to hearing from you.

Yours Sincerely,

Rose Rushton (BRIEN)

APPENDIX B: PERMISSION LETTER SCHOOL HEAD

[Head Teacher name]

[School name and address]

[Date]

A Socio-Cultural Model of Play-Based Pedagogy for Mathematics in Diverse South African Grade R Classrooms

Ethics Approval Reference: [insert]

Dear [Head teacher name],

I am writing to enquire about conducting some research in your school this year. My name is Rosemary Rushton, and I am a lecturer in Foundation Phase Mathematics at Cape Peninsula University of Technology. I am also doing my PhD through the University of Pretoria, where my focus of study is on the pedagogy of play and Mathematics in teaching and learning. I aim to work with Grade R teachers who wish to enhance their skills and collaborate with me to develop a model that supports the promotion of Mathematics through play in diverse classroom contexts.

This process, described as participatory action research will entail me working closely with Grade R teachers for Term 1, Term 2 and Term 3 of 2022. It entails initial teacher interviews, class observations, follow-up interviews with suggested intervention and support, further follow-up observations and concluding interviews. The interviews and class observations will be recorded using Dictaphone Apps and video cameras. Additionally, workbooks and materials will be photographed, where need be.

The teachers will not be required to deviate from guidelines stipulated in the CAPS Mathematics Document, but rather, receive theory-informed guidance through collaboration with me as to how best they can promote these skills through the use of play-based activities that reflect the diverse cultures in which they are situated. It must be stressed that the research will be *with* Grade R teachers, not on Grade teachers. As a former teacher and someone familiar with class environments, particularly Grade R, I intend to cause minimal disruption to the daily programme, and I ensure to only discuss

activity during feedback sessions with the assurance that there will be no interruptions during teaching and learning.

Your school and Grade R teacher will be allowed to select their pseudonyms, in keeping with the democratic nature of participatory action research and in doing so, ensure that the participants feel a sense of trust and autonomy in the process. The learner's identities will be protected, and all faces will not be revealed or disclosed in the writing up of this study. The video camera will focus on the teacher and/or the board throughout and any incidental images of learners will not be seen by anyone else or used for research without further explicit permission. The teachers will be consulted at each stage of the process and the findings from all data will need to be presented with consent from the respective teachers.

All information will be password protected and visible only to the supervisors and researcher. All data collected will only be used for academic purposes. At the end of the study, all the data will be securely stored in the archives at the University of Pretoria. You may ask questions before or during the time of your participation. If you have any concerns regarding the data collection procedures, please notify me or my supervisors.

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In order to avoid the spread of the virus due to COVID-19 pandemic and achieve anonymity, the interviews will be conducted as an online text-based interview. For the observations, all COVID protocols will be adhered to in line with the national guideline and the University of Johannesburg guideline.

Please note that since this is a voluntary participation, there will be no reward or monetary payments to any participant.

Should the teachers wish to withdraw from the study, they may do so at any point, and are also welcomed to ask for more information should they not understand any process or require further details.

If your school would like to take part in the study, or you need more information about what is involved, please contact me. Whether or not you feel it would be appropriate for your school to participate, I would be grateful if you would complete the pro-forma below and return it to me via email.

Thank you for your time and attention. I look forward to hearing from you.

Yours Sincerely,

RdLRushton

Rose Rushton (Brien)

A Socio-Cultural Model of Play-Based Pedagogy for Mathematics in Diverse South African Grade R Classrooms

Rose Rushton

University of Pretoria

Department of Early Childhood Development

[School name]

[School address]

[Head Teacher name]

[Grade R teacher]

- We do not wish to participate in this project.
- We would like to find out more about this project.
- We would like to take part in this project.

If you would like further information or are interested in taking part, please give the name of a contact person for your school, and details of the best way to contact him or her.

Contact name: _____

Contact email: _____

Contact telephone number: _____

Please return this form via email to: rosebrien1@gmail.com /0824656557

Thank you for your help.

APPENDIX C: PERMISSION LETTER TEACHERS

[Head Teacher name]

[School name and address]

[Date]

A Socio-Cultural Model of Play-Based Pedagogy for Mathematics in Diverse South African Grade R Classrooms

Ethics Approval Reference: [insert]

Dear [Head teacher name],

I am writing to enquire about conducting some research in your school this year. My name is Rosemary Brien, and I am a lecturer in Foundation Phase Mathematics at Cape Peninsula University of Technology. I am also doing my PhD through the University of Pretoria, where my focus of study is on the pedagogy of play and Mathematics in teaching and learning. I aim to work with Grade R teachers who wish to enhance their skills and collaborate with me to develop a model that supports the promotion of Mathematics through play in diverse classroom contexts.

This process, described as participatory action research will entail me working closely with Grade R teachers for Term 1, Term 2 and Term 3 of 2022. It entails initial teacher interviews, class observations, follow-up interviews with suggested intervention and support, further follow-up observations and concluding interviews. The interviews and class observations will be recorded using Dictaphone Apps and video cameras. Additionally, workbooks and materials will be photographed, where need be.

The teachers will not be required to deviate from guidelines stipulated in the CAPS Mathematics Document, but rather, receive theory-informed guidance through collaboration with me as to how best they can promote these skills through the use of play-based activities that reflect the diverse cultures in which they are situated. It must be stressed that the research will be *with* Grade R teachers, not on Grade teachers. As a former teacher and someone familiar with class environments, particularly Grade R, I intend to cause minimal disruption to the daily programme, and I ensure to only discuss activity during feedback sessions with the assurance that there will be no interruptions during teaching and learning.

Your school and Grade R teacher will be allowed to select their own pseudonyms, in keeping with the democratic nature of participatory action research and in doing so, ensure that the participants feel a sense of trust and autonomy in the process. The learner's identities will be protected, and all faces will not be revealed or disclosed in the writing up of this study. The video camera will focus on the teacher and/or the board throughout and any incidental images of learners will not be seen by anyone else or used for research without further explicit permission. The teachers will be consulted at each stage of the process and the findings from all data will need to be presented with consent from the respective teachers.

All information will be password protected and visible only to the supervisors and researcher. All data collected will only be used for academic purposes. At the end of the study, all the data will be securely stored in the archives at the University of Pretoria. You may ask questions before or during the time of your participation. If you have any concerns regarding the data collection procedures, please notify me or my supervisors.

We would also like to request your permission to use your data, confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis using the data for research purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

In order to avoid the spread of the virus due to COVID-19 pandemic and achieve anonymity, the interviews will be conducted as an online text-based interview. For the observations, all COVID protocols will be adhered to in line with the national guideline and the University of Johannesburg guideline.

Please note that since this is a voluntary participation, there will be no reward or monetary payments to any participant.

Should the teachers wish to withdraw from the study, they may do so at any point, and are also welcomed to ask for more information should they not understand any process or require further details.

If your school would like to take part in the study, or you need more information about what is involved, please contact me. Whether or not you feel it would be appropriate for your school to participate, I would be grateful if you would complete the pro-forma below and return it to me via email.

Thank you for your time and attention. I look forward to hearing from you.

Yours Sincerely,

Rose Rushton (Brien)

A Socio-Cultural Model of Play-Based Pedagogy for Mathematics in Diverse South-African Grade R Classrooms

Rose Brien

University of Pretoria

Department of Early Childhood Development

[School name]

[School address]

[Head Teacher name]

[Grade R teacher]

- We do not wish to participate in this project.
- We would like to find out more about this project.
- We would like to take part in this project.

If you would like further information or are interested in taking part, please give the name of a contact person for your school, and details of the best way to contact him or her.

Contact name: _____

Contact email: _____

Contact telephone number: _____

Please return this form via email to: rosebrien1@gmail.com /0824656557

Thank you for your help.

APPENDIX D: CONSENT FORM TEACHERS

CONSENT FORM TEACHERS (WILL ACCOMPANY LETTER)		
Kindly complete the table below before participating in the research.		
Tick the appropriate column		
Statement	Yes	No
1. I understand the purpose of the research.		
2. I understand what the research requires of me.		
3. I volunteer to take part in the research.		
4. I know that I can withdraw at any time.		
5. I understand that there will not be any form of discrimination against me as a result of my participation or non-participation.		
6. I understand that I will not receive any remuneration for this work.		
7. Comment:		
Please sign the consent form. You will be given a copy of this form on request.		
Signature of participant	Date	

APPENDIX E: PERMISSION LETTER TO PARENTS

[School name and address]

[Date]

A Socio-Cultural Model of Play-Based Pedagogy for Mathematics in Diverse South African Grade R Classrooms

Ethics Approval Reference: [insert]

Dear Parents and Guardians

My name is Rosemary Brien, and I am a lecturer in Foundation Phase Mathematics at Cape Peninsula University of Technology. I am also doing my PhD through the University of Pretoria, where my focus of study is on the pedagogy of play and Mathematics in teaching and learning. It is my aim to work with Grade R teachers who wish to enhance their skills and collaborate with me to develop a model that supports the promotion of Mathematics through play in diverse classroom contexts. I have chosen your child's class as my research setting.

This process, described as participatory action research will entail me working closely with Grade R teachers for Term 1, Term 2 and Term 3 of 2022. It entails an initial interview, class observations, follow-up interviews with suggested intervention and support, further follow-up observations and concluding interviews. The interviews and class observations will be recorded using Dictaphone Apps and video-cameras. Additionally, workbooks and materials will be photographed, where need be.

As your child participates in all class activities, I need to obtain informed consent from you as per ethical standards guiding educational research. It must be stressed that the research project aims to work *with* Grade R teachers to as to strengthen the mathematics teaching processes in the community. As a former teacher and someone familiar with class environments, particularly Grade R, it is my intention to cause minimal disruption to the daily programme and I ensure to only discuss activity during feedback sessions with the assurance that there will be no interruptions during teaching and learning. All learner's identities will be protected, and all faces will not be revealed or disclosed in the writing up of this study. The video camera will focus on the teaching methods and/or the board throughout and any incidental images of learners will not be seen by anyone else.

Your child's school and Grade R educator will be allowed to select their own pseudonyms, in keeping with the democratic nature of participatory action research and in doing so, ensure that a sense of trust and autonomy is developed in the process. All information will be password protected and visible only to the supervisors and researcher. All data collected will only be used for academic purposes. At the end of the study, all the data will be securely stored in the archives at the University of Pretoria.

I also like to request your permission to use your data, confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis using the data for research purposes. The confidentiality and privacy applicable to this study will be binding on future research studies. You may ask questions before or during the time of your participation. If you have any concerns regarding the data collection procedures, please notify me or my supervisors. In order to avoid the spread of the virus due to COVID-19 pandemic and achieve anonymity, the interviews will be conducted as an online text-based interview. For the observations, all COVID protocols will be adhered to in line with the national guideline and the University of Johannesburg guideline.

Should you wish for your child to withdraw from the study, you may do so at any point, and are also welcomed to ask for more information should you not understand any process or require further details. Please note that since this is a voluntary participation, there will be no reward or monetary payments to any participant.

Thank you for your time and attention. I look forward to hearing from you.

Yours Sincerely,

RdLBrien

Rosemary Rushton (nee Brien)

Reply Slip: please return this			
Consent to be part of the study is granted		YES	NO
Name of Study: A Socio-Cultural Model of Play-Based Pedagogy for Mathematics in Diverse South-African Grade R Classrooms			
	Your Name and Surname	Child's Name and Surname	Parent / Guardian / Nurse

			As Witness
Name Please Print			
Your Signature			
Date	Day	Month	Year

APPENDIX F: INFORMATION AND ASSENT FORM MINORS

INFORMATION AND ASSENT DOCUMENT MINORS

5–7 YEARS

Study title:

.....

Principal investigator:

.....

Supervisor:

.....

Institution:

.....

Daytime telephone number/s:

.....

Date and time of informed consent discussion:

Date	Month	Year

Time

1) INTRODUCTION

My name Rose and my job is to study, and help teachers teach children mathematics. I want to know more about how your teacher works with you during the day so that I can give her ideas on how to make you confident and happy when doing Mathematics
I am going to explain to you a bit about my job and what will happen when I visit your class to see your teacher doing her work with you. I have talked to your mom/dad/parents/guardians about this, and they know that I am also asking for your permission. If you are going to be part in this study, your mom/dad/legal guardian also has to say yes. But if you do not wish to, you do not have to. You do not have to decide/ say yes or no today.

There may be some words you don't understand or things that you want me to explain

to you. Please ask me to stop at any time and I will explain.

2) WHAT IS RESEARCH?

Research is what we do to find new knowledge about subjects (and people). Research also helps us to find better ways of teaching and making school for learners the best.

3) WHAT IS THIS RESEARCH PROJECT ALL ABOUT AND WHAT IS EXPECTED OF YOU?

Nothing is expected of you, there will be no tests or quizzes. You will just have to come to school and do everything like you do every day.

4) WHO IS DOING THE RESEARCH?

I am the only person visiting your class.

5) WHAT WILL HAPPEN TO ME IN THIS STUDY?

Nothing at all. Your teacher might be asked to play more games about Mathematics, but you will not have anything happen to you.

6) ETHICS APPROVAL

This Protocol was submitted to the Faculty of Health Sciences Research Ethics Committee, University of Pretoria, Medical Campus, Tswelopele Building, Level 4-59, Telephone numbers 012 356 3084 / 012 356 3085 and written approval has been granted by that committee.

7) WILL ANYONE KNOW I AM IN THE STUDY?

Only the study teachers and people reading about this study.

8) WHO CAN I TALK TO ABOUT THE STUDY?

You can ask me questions at any time and your parents/guardians can ask me any questions at any time.

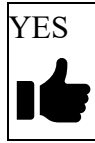
9) WHAT IF I DO NOT WANT TO DO THIS?

You do not have to participate in the study, even if your mom/ dad/ legal guardians have signed consent that you can participate.

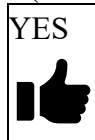
You can also withdraw from the study at any time without getting in trouble.

10) CONSENT TO PARTICIPATE IN THIS STUDY

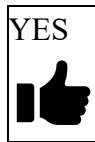
Do you understand this research study and are you willing to participate in it?



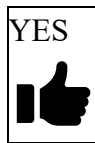
Do you understand that(What is expected of you as participant)



Has the researcher answered all your questions?



Do you understand that you can pull out of the study at any time without any one consequences?



You don't have to give us your answer now, take your time and read the rest of this form before you decide.

If you sign at the bottom it will mean that you have read this paper, and that you would like to be in this study.

	Your Name	Person Obtaining Consent	Parent / Guardian / Nurse As Witness
Name Please Print	Written by researcher but identified by learner		
Signature	Or similar marking		
Date			

APPENDIX G: ETHICAL CLEARANCES



Western Cape
Government

Education

Directorate: Research

meshack.kanzi@westerncape.gov.za

Tel: +27 021 467 2350

Fax: 086 590 2282

Private Bag x9114, Cape Town, 8000

wced.wcape.gov.za

REFERENCE: 20220517-2210

ENQUIRIES: Mr M Kanzi

Ms Rosemary Rushton (Brien)
6 The Courtyard 17
Glenugie Avenue
Tokai
7945

Dear Rosemary Rushton (Brien),

RESEARCH PROPOSAL: A SOCIO-CULTURAL MODEL OF PLAY-BASED PEDAGOGY FOR MATHEMATICS IN DIVERSE SOUTH-AFRICAN GRADE R CLASSROOMS.

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **17 May 2022 till 30 September 2022**.
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Mr M Kanzi at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Research Services
Western Cape Education Department
Private Bag X9114
CAPE TOWN
8000**

We wish you success in your research.

Kind regards,
Meshack Kanzi
Directorate: Research
DATE: 17 May 2022

Dear Ms RDL Rushton (Brien)

The application for ethical clearance for the research project described below served before this committee on 16 March 2022:

Ethics Protocol No:	EDU201/21
Principal investigator:	Ms RDL Rushton (Brien)
Student/Staff No:	21822272
Degree:	Doctoral
Supervisor/Promoter:	Prof AE Muthivhi
Department:	Early Childhood Education

The decision by the committee is reflected below:

Decision:	Approved
Comments:	
Period of approval:	Three years

The approval by the Ethics Committee is subject to the following conditions being met:

1. The research will be conducted as stipulated on the application form submitted to the Ethics Committee with the supporting documents.
2. Proof of how you adhered to the Department of Basic Education (DBE) policy for research must be submitted where relevant.
3. In the event that the research protocol changed for whatever reason the Ethics Committee must be notified thereof by submitting an amendment to the application, together with all the supporting documentation that will be used for data collection namely: questionnaires, interview schedules and observation schedules, for further approval before data can be collected. The changes may include the following but are not limited to:
 - Change of investigator,
 - Research methods any other aspect therefore and,
 - Participants.

The Ethics Committee of the Faculty of Education does not accept any liability for research misconduct, of whatsoever nature, committed by the researcher(s) in the implementation of the approved protocol.

Best wishes



Prof Funke Omidire
Chair: Ethics Committee
Faculty of Education



Directorate: Research

meshack.kanzi@westerncape.gov.za
Tel: +27 021 467 2350
Fax: 086 590 2282
Private Bag x9114, Cape Town, 8000
wced.wcape.gov.za

REFERENCE: 16375E04C00006E-20230427
ENQUIRIES: Mr M Kanzi

Ms Rosemary Brien
6 The Courtyard
17 Glenugie Avenue
Tokai
7945

Dear Rosemary Brien,

RESEARCH PROPOSAL: A SOCIO-CULTURAL MODEL OF PLAY-BASED PEDAGOGY FOR MATHEMATICS IN DIVERSE SOUTH-AFRICAN GRADE R CLASSROOM * THIS IS PART OF AN EXISTING STUDY - I AM JUST APPLYING FOR AN EXTENSION UNTIL SEPTEMBER 2023.

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **12 June 2023 till 31 March 2024.**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Mr M Kanzi at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Research Services
Western Cape Education Department
Private Bag X9114
CAPE TOWN
8000**

We wish you success in your research.

Kind regards,
Meshack Kanzi
Directorate: Research
DATE: 12 June 2023

APPENDIX H: INTERVIEW SCHEDULE

Interview pre-intervention (semi-structured) – questions *could* include and will vary according to each setting, guided by:

Luria's clinical interview technique (Luria, 1976) and standards laid out by the British Educational Research Association

-
- Tell me a little bit about how you see your role as a Grade R educator wrt teaching mathematics, what are your aspirations and ambitions that made you follow this path?
 - How satisfied are you with your teaching of mathematics? What do you see as some of your strengths and what do you experience in terms of needing more support?
 - Would you please describe how you manage the integration of mathematics into the Grade R daily programme?
 - How do you find the CAPS document as a guide? How helpful is it in guiding your daily teaching?
 - Describe some of the challenges that you experience in teaching Grade R mathematics.
 - Do you feel supported by your HOD/ do you other colleagues?
 - How supportive are the parents of the Grade R learners?
 - How well do you think the learners respond to mathematics teaching in Grade R?
 - What are some of the difficulties that the learners experience with mathematics?
 - How (or do) you integrate play into the daily program? If not, would you please discuss why this is so.
 - How important is the role of language in the teaching of mathematics and how so you manage diversity of language in your class?
 - Is teaching mathematics something you enjoy?

- What are the learners' attitudes towards mathematics? Can you say this is a general sentiment?
- Are the opportunities for the learners to have fun when learning mathematics? Could you please describe or provide examples?
- How much time per day is spent doing worksheets or activity book? Are these marked?
- Do the learners work and play together doing mathematics?
- Do you incorporate mathematics into the morning ring? Could you please provide me with some examples of how this is achieved?
- How do you wish to be better supported in teaching mathematics?
- What tools/manipulatives/representations do you use and find the most effective when teaching mathematics?
- Describe the learner's contexts in your class. How do believe that this impacts the learning in your class?
- How do you teach (or plan) to support diverse cultures in your classroom
- How do you feel about an outsider coming into your classroom?
- How can I reassure you that this is a partnership where the focus is on meaning-making and collaboration?
- What questions do you have before we commence with class observations?

APPENDIX I: TRANSCRIPT LEARNERS

They start building a house

Child 1:

“Oooh, nice!”

Child 2:

“Where is our cars?”

Child 1:

“Huh?”

Child 2:

“Our cars.”

Child 1:

“Mmm ... we need wind.”

mumbling

“Ah, we need one more thing here.”

Child 2:

“Here?”

“Where’s the roof?”

“Oh, look!”

Child 1:

“Oh no!”

Child 2:

“Oh look!”

Child 1:

mumbling

Child 2:

“Ah man, *clicks* *mumbles*”

Child 1:

squeals

Child 2:

mumbles “Move!”

something falls

Child 1:

“Awww, when did it fall down?”

Child 2:

“Sorry”

“Let’s make ... Nquas?”

Child 1:

“Let’s make cars”

Child 2:

“Let’s make six and ... and one”

“Come, take this car, I’m coming now.”

Child 1:

“I’m making, uh, four”

Child 2:

“Number one!”

Child 1:

“Number two.”

“Man, *mumbles*”

Recording ends

APPENDIX J: INTERVIEW WITH TEACHER M

RB:

So basically I record it only because I can't write everything down, and also because it is research, like once I did this research thing, where I heard this amazing story that these children came up with, it was so creative, but I wasn't recording it, I was just listening. And then I didn't have evidence, and it was like, it was the most superb example of working through your issues through play, and I hadn't recorded it. So I wasn't allowed to include it in my study. So I – I – I record it, but it's not like it would ever be published, but it's just I have to say that this is what happened, and I can show you, kind of thing.

interruption

So, um, I don't want to jump ahead to ask more questions. But just to summarise – you do feel comfortable here – uh, that's what you meant, you didn't mean that, you know, that you – you think that Grade R is not valued in the school. You just feel it's where you fit in. And it comes from sort of you being in that sort of context of always being around people since you were young and knowing that this is your space. And you, even when you're qualified, you'd rather stay here, but you'd rather be qualified in order to – in order to secure your place, and to also kind of um, prove that you've got that knowledge and skills, am I right?

M:

Yes.

RB:

Awesome. So you'll probably qualify next year?

M:

Next year's my last year.

RB:

Fantastic, so you're in third year.

M:

Yes. Third – third and I'm finishing off third year and I've started with two of my fourth year subjects only.

RB:

Amazing, amazing ... um, ok so I'm not gonna talk much more 'coz I know time is an issue, um, if you had to think of strengths, what do you think your strengths are? As a teacher here. What do you bring, Teacher M?

M:

I think my – one of my stand – I'm a very organised person, I love being organised. I love being prepared, um ... I always say I feel I must meet my – my daily needs like, if a lesson for example, if ... maybe I finish the lesson I'll – due to time or something –

RB:

Or like, someone like me coming in.

M:

laughs – then I feel almost like I didn't achieve my full for the day, and I feel like I didn't, I didn't do what I have to do, and tomorrow I'll have to include that – like I did this morning, where we had the other graph, yesterday it was – the time was just out. And then, I didn't get to do or get to present the graph, so this morning I made sure it was the first thing I did.

RB:

Lovely. And do you feel there's that flexibility in your programme to include things that you need to.

M:

Yes, yes, we make – we make it work, whatever comes our way, we make it work. And also think rac– I know we work nicely together as a grade, even the principal says.

RB:

You do, you do.

M:

If ... – There's lots of grades who would love – you should see how we work together.

RB:

As an example.

M:

Mm ...

RB:

Well certainly it's something I – I've seen, you ... How do you plan? Do you, do you ... does someone take the lead? Or, do you all just ...

M:

So we have – we have, um ... We – we plan at the end of Term 2, we did the whole planning for Term 3, then each planning is on a two-week basis. So the story gets covered over two week – over two weeks. And th-

RB:

And is that according to the guide?

M:

According to CAPS and we integrate. And then I do a weekly – I'm in charge of the weekly, um, planning so ... For every week I give them a paper – we said that we're going to start typing them, because we had a meeting where they said this is actually evidence.

RB:

Oh, yes, so do you do that? I saw that. Can I take a picture of it? If you don't mind.

M:

I do it weekly, where –

interruption, mumbling

RB:

You see, I don't actually type my notes out, I write them. I typed the other day because I'd forgotten my page, but I like to write them, because then when I look at them rather than type it out, I think more about them. Instead of just having it typed out and then I forget about, you know?

M:

Mm.

RB:

So you do that? That's your organisation coming in. Are you the most –

M:

It's actually something we're not supposed to do but I feel because, then in the morning they're asking, um, what are we doing today? And then we just go to a page –

RB:

So you – you haven't got time to extract.

M:

I – I do it weekly and I do it daily. So this is your weekly, where you wanna see for this week for maths this is your concept, for language this is your sound, this is your focus. Same with the theme table, activities is there only, then –

RB:

So you've taken it out of CAPS. And the other guide. You –

M:

So this is now worked out –

RB:

The simplified version.

M:

Our – our term planning, so every two weeks I break it up to weekly and daily. So in the morning, I will now send them – “morning guys, maths we’re covering this. This is the activities, 1 – life skills, language.”

RB:

That’s a lot of work.

M:

I like being organised.

RB:

Have you done it for the whole year?

M:

Yes. I actually – I started taking that initiative last year. And last year – I just felt it was more organised instead of me coming and, what did we say now again? What we, no, you’re wasting time, and –

RB:

Do you think it’s something CAPS could do better? Like, they tell you what to do, but they don’t –

M:

Well, we work out on our own, they give us the concepts and the stuff they expect the children to know by each term, then we just work it into a lesson, and into activities for them to write, to grasp the concept, or ...

RB:

Mm. Okay, awesome. Sjoh, okay! I think that’s enough for one day. You guys are amazing. Shame, Teacher, um, A was talking about the, uh, sponsor day. She’s feeling a

bit stressed about the learners who might not come. Like, the R100 for the ... Do you also feel that that's a lot?

M:

Um, majority of my children pays, I just have my little helper actually, she, um, she's not by that means. So like what – with the last fundraiser I just paid for her meal. So she only gets the meal, um, but I don't know – I asked her this morning if she was going to partake, so she said she don't know.

RB:

Oh, shame. That must be hard, hey?

M:

But she's the only one that ... I think that it's kind of 6:32 _____? Today you can't do that, you know, you go knock on the door, and ...

RB:

No. Can't go and ask.

M:

For children its actually a benefit because mommy don't have, but at least if they can fill their list, by everybody putting on a R2 or R5, then at least they are also included.

RB:

Can't do that anymore.

M:

Can't do that. Definitely not.

RB:

And it quite a lot of –

M:

I think my daughters could actually still done, and then my husband said striaght: no ways, just put on the money. 'Coz I remember when I was four, we used to go –

RB:

Oh, um, me too, we'd go around and some people would give like fifty cents and two rand fifty, and.

M:

We used to go and knock and make our list with a ____ And uh, definitely not today.

RB:

Times are different hey. Ya.

M:

Definitely.

RB:

Awesome. So what I think I'll do is I'll just end it today, oh, the one thing, um, one thing I asked Teacher ____? 7:28 to think about it, she kind of did answer me, but, you could think about it because I think she's on her own on the field and I don't want her to overstep the mark here, time wise. I want you to think about maybe how supported you are in your role? Do you feel that you get enough support, support in any way. Support from ... we spoke a little bit about the department. A little bit about your – your HOD, I haven't really heard about your HO – I've heard about Mrs Africa. But like, how supported are you, by the parents, by each other – you seem fairly supported. So maybe that's just something you want to think about. And then we can sort of pick up on that at a later stage. Um, the one thing I did also want to say to you at the outset of this, and I told Mrs A the same. If there's something you've discussed, or there's something you don't feel comfortable with, you don't have to answer me. If there's something that happens after the interview that you feel that afterwards actually I wasn't comfortable with the way that interview went, we won't include it. It's – it's a process where you are, your rights and your ... you know what I'm saying, you have to be comfortable here. And the more we talk the more we share. So ultimately what we're doing is we're just having discussions about your role and trying to figure out every little piece of this puzzle, that it is a community of practice, because essentially I'll explain the theory, but – but you know, to explain a theory in one

day. Is – is – is very hard, but it's like an activity assessment. If I look at when you told me you had a sore, uh, tooth, how your body feels not right when you've got one thing out of place. So what this activity system does is it looks at the system as a whole, and how is this body working. How's it functioning? You can't function without all the parts being right. And some of the parts are out of your control. Like a heart condition. Like if you can't help it that you have a heart condition. And just like you were saying, you know, you – you're not – you're not fully recognised by the department, that's something out of your control. But – but what is in your control, and how can we, kind of, make this work as best as it can. And it's actually far, um, far more rewarding, I feel as a researcher to work in a community where everyone's wanting to be the best and wanting to plan. Um, than working in a community who perhaps needs a lot of help but doesn't really care. It's more, it's more, you know, it's kind of ... if that makes sense? Like, I – I wanted to come and work at a school where I knew things were working well, funnily enough. And kind of almost become like a, uh, a benchmark, like this is – this is how we all work and share ideas and go and we share our knowledge and we kind of use what we can to the best, if there's such a word, best practice. So that's where I'm going with that. So maybe just think about support and, like, I mentioned, um, to Teacher A that I felt like I noticed that I think you work quite hard and you're very hands-on, that you know, maybe could do with more assistance. Like I saw today, it was easier for all of you, because you've just got an extra set of hands to do this. So anyways, it might be just like that, you know, like, saying what I think I need in an assistant. Not that I can get you one *laughs* but, you know – this is what she told me too.

M:

They actually did, no, they actually did mention that, the assist – assistants are finishing now, but from February everyone is getting an assistant. But uh, we had an assistant last year. Oh my word, such a lovely lady.

RB:

Oh wow. Was that because of COVID?

M:

That is why we got the assistance, and then, um, yoh, I must say when she was here, she was so hands-on, you didn't even have to ask her or explain to her, like she would just

fall in. And then she also, she did study also in the sense of, and she didn't finish her qualification. And then I was telling them, like – like I can see she's, uh, a passionate teacher, you know I don't know what she's waiting for.

RB:

It's something that you can't really teach, some people just have it, hey? That intuition.

M:

She is going to – she is first going to rewrite her subjects, and then she's going to apply for her B.Ed. But she got a job, um, at the creche near Century. So I – you know, we was sad when she left because she was like, hands-on, and the children – she knew I had to be firm with them, but in a nice way. Yoh, we really enjoyed her, we really enjoyed her ... So we would like her to rotate her, her months. We would fight to have her! *laughs* “No but you've had her twice already for the week!” So their contract couldn't be renewed, so it only February –

RB:

Was that the COVID story, hey?

M:

Yes. So anybody that resigned now, you can't put somebody back in. So only next year, but I'm glad, looking forward to that. Where each one will have –

RB:

Ya I think you need it, that's my – that's my opinion. So think about what support and like how you sort of, you feel, um, but I'm glad to hear you feel valued. Because you do amazing work.

M:

School-wise I know we; I must say we have good support. My HOD, that's full on support, whether it's personally, or, or... she is –

RB:

Oh really? Is that Mrs. –

M:

Mrs. [redacted]. I take my hat off for her. She is ... she's like that great mother figure that comes for all, she's ... really she's always – she first sees for your needs, whatever you come with, she sorts your needs out. So that I like about her, she's very helpful, she –

RB:

And the thing is, if you feel supported, and – and – and cared, then you – you ... become motivated, hey. And stay motivated.

M:

Definitely. And with Mrs. [redacted] as well, I personally feel ... you feel free to speak to them about anything if you're not happy with something, maybe – whatever it could be with the grade, or maybe somethings bothering you or if you need something, then we get the allocations ... We get to us the allocations by resources for our ... only the Grade R's. So, like whatever we need, whether it's now even something maybe we must take _____? 13:38 will see to it, she sorts us out.

RB:

That's amazing. They're very hands-on

M:

At school I must say we have a – uh, [redacted], we're like family basically. Like, we're like a family at W.

RB:

You're all very professional too. Hey? Very professional.

M:

Many people ask me: “Oh ten years at W, why don't you get something near to your home, like ...” But to travel here is nothing because I'm happy here. I'm happy here. If I wasn't happy obviously I would.

RB:

No absolutely.

M:

I would get some nearer, but ... they tell me “you’re there in Kensington! That far from home”. And I’m like yoh, you don’t understand like, I’m happy here, I look forward to getting up and going to work.

RB:

That’s lovely, even though you’ve got young kids too.

M:

Mm ... That’s – I actually did say when my daughter was born then my daughters – my daughter’s Grade 4 already, I said when she’s going to start school, I must be somewhere nearer to my home, but it never happened.

RB:

And now she’s _____? 14:29

M:

She’s in Grade 4 now, my son is in Grade R.

RB:

Oh that’s lovely ... Ugh no it’s amazing.

M:

I wanted to put them in here actually, I did enrolled my daughter, and then I thought oh it’s also not gonna be fair towards her, ‘coz I have meetings, you know, so a day already feels long for the child, so she must now sit here and –

RB:

And I suppose you don’t also want to be treated differently because she’s your daughter. Perhaps.

M:

Mm. Also that, you know obviously I really want her in my class, and, my colleague – my other colleague said: “Oh no, she wouldn’t want to take my daughter ‘coz she now don’t know” ... And then I thought, “Oh okay, it’s not gonna work”.

RB:

That’s wise, that’s wise ... I’ve seen that where I used to teach. And there was only one class per grade. It was a hard year for that mother and daughter. At one stage I came in and the daughter was hiding under the table and the mother was being so strict. You either over compensate or you under compensate.

M:

True, true ... and my son also had a thing where my mommy – I want to be in my mommy’s class, and my mommy’s – and I was like oh no this is not going to work! This is definitely not going to work. Because his teacher was telling me when we went to the parent meeting: oh no your son brags, my mommy’s also a teacher like you. Teacher whose a mommy in Grade R. And my mommy brought this home for me to do, c –

RB:

So my mom knows best. Mom’s always knows best! But it’s true! They often do. And tell me, next week, are you okay for me to come, or not really because you’ve got your lecturer coming in?

M:

No its fine, I think I’m going to let my lecturer come on Wednesday or Thursday.

RB:

Show them how you do your amazing tennis.

M:

augh No no, I don’t think they’ll – I was thinking in the morning I’m gonna let them come early morning, when the children are also like still sleeping, and they’ve like settled down, and *mumbles* –

recording ends

APPENDIX K: INTERVIEW TEACHER A

RB:

Ok well, first of all, I – I just need to explain this to you, so I only record it because otherwise I have to write everything down and then it will – will be finished by 2:30 this afternoon (laughs). So I just record it and the recordings aren't published or anything, but they're just used for me to then refer back to and make notes from. So obviously I'm just going to explain the process to you if at any point you don't feel comfortable answering something or you need more clarity, you can ask me, this is a safe space, umm and really if, if there's anything you need more clarity on or if you want to stop the process you just can do that at any time. Even later, after the process, if you feel that it wasn't done in a way that made you feel comfortable you can just let me know and I can just delete the recording, it's – it's really – it's a safe space, so I need you to know that. And, um, obviously, once I've done the individual interviews, just to find out more about you, I'll reflect on that, and then what I was hoping to do was do group interviews where we all sit and I explain, a little bit of the theory, not that you don't know the theory, but a little bit of theory behind my research, and how it sort of fits in your contexts, umm, on like basically we are being communities of practice when we share and we strengthen each other, it's not a case of expert knowledge and non-expert, it's a case of let's, let's share best practice and kind of come to an understanding of, of these models that I use. So what I like to do is when I start the interviews just like, I want to know how you came to be at W, if you could just tell me a little bit about you, and how you came to W, obviously my focus is on math education, it doesn't mean we can't talk about other things, how did you find yourself as a Grade R teacher ... Just tell me.

Teacher A:

Umm, *clears throat*, I was, I was umm, working as a normal ... after high school. My plan was to go and study teaching from the beginning, I've always wanted to be a teacher, like, since I was very young. Um, also probably because most of my aunties, they are all teachers, or, most of them have retired now already. Um so, it was always my passion to be a teacher. However I took time to, like a gap year after matric, and then I went to go and work as a normal, um, in the normal call centre, and then I left that job to go and study full-time, so I studied full-time to be and I knew I wanted to be a Grade R teacher, just like it was my set goal to be a Grade R teacher. And then um as I was – when I was

completed, when I completed my studies, um my husband is now currently my husband now, at that time we weren't married yet. So um – he just looked online for like, jobs and then he came across this job, and I wasn't really familiar with the Kensington area at the time because I wasn't – I'm from Athlone area. So I never really came to this side and I didn't know anybody in this area. But I took the job and came to the interview, um, and they offered me the job and I took it. The beginning was a little bit difficult with travelling purposes, 'coz I used to travel, to town and from town used to come to here.

RB:

Oh, really?

Teacher A:

Yes, and then going back home as well, and then I tried the other route with – then I would've had to walk, um, from Bridgetown to the mall, and take a taxi from there to RCS³¹ and from RCS to here.

RB:

So just getting to school in the morning was a difficulty.

Teacher A:

And then later in the afternoons, I used to travel to town, and then from – it would've been easier for me to travel to town, and then down to Athlone, coz if I do, if I take that taxi, then it drops me by my house, where if I take the other route with RCS I still have to walk from the mall to –

RB:

What is the RCS?

Teacher A:

Here on the corner, I think it's um Libatus? On that corner

RB:

What does RCS stand for? Do you know? Is it like a transport, or –

³¹ RCS is a call centre (term defined later in the interview).

Teacher A:

It's a call centre.

RB:

Ohhhh, okay.

Teacher A:

It's like, it's like an account – there's like different shops that you can buy on there, but the call centre is on the corner.

RB:

Oh, and that's where you used to stand.

Teacher A:

I used to stand there waiting for taxis, but then now I got married and uh, my husband obviously started lifting me to work.

RB:

Ah, so your husband supports you a lot.

Teacher A:

Yes he does.

RB:

So where did you study?

Teacher A:

At the College of Cape Town, Gardens campus ?

RB:

Okay! I'm thinking that I might have seen you there. Um.. There was that Afrikaans lady who was the head there.

Teacher A:

Teacher Bosman?

RB:

Ya, and then you walked into the Gardens campus, there was a class on the right. The creche.

Teacher A:

Yes, the creche on the right. They're still going. I wasn't at the creche.

(Speaking to the learner who walks in): Mr., I have five minutes, half past ten.

RB:

Shame, okay, well that's interesting. And, I'm just going through all the kinds of questions that I think suit you the best. Um, so obviously what we do is go from quite broad questions to quite specific questions. So you adjusted quite quickly, you know, and – and how would you say your experience of, well you were in a working school, how would you say your training versus what the real classroom is like? How do you feel that mapped?

Teacher A:

From like what I studied from –

RB:

Yes.

Teacher A:

Look it's – it's – the majority of it is still the same, like bas – like basically what they taught us and what we do now, is just that what will be different is that the curriculum changes, quite often. I won't say every year but, quite often, so like, if a maths course that we went on, the maths that we are doing now, the language that we are doing now, is different to what they taught us. They taught us more like, um, creativity for the kids, um

RB:

Oh that's interesting

Teacher A:

Educare didactics – and you know those type of stuff, the psychology part of it, ‘coz I did education and psychology, it was one of my subjects.

RB:

That’s interesting

Teacher A:

So like those, like how to handle the child, how to work with the child in psychological ways. So like, more like that, but I don’t – basically what, the training that we had, or like what I’m doing now is basically a course that we are then going to training from like the maths as, as actually a course we did from the year, the same thing with the language as well. So it’s different to work I’ve –

RB:

It’s different, how like? Do you find it like, less creative?

Teacher A:

More creative.

RB:

More creative than the new one?

Teacher A:

Because we do more – we’re focusing more on concrete activities with the kids and not just – they’re trying to work away the um pages that – they want the kids to be more practical.

RB:

That’s great. Yes. Like for instance today that task I saw you doing

Teacher A:

Yes!

RB :

Lovely.

Teacher A:

Even, even the blocks over here

RB:

Yes

Teacher A:

So they had to build something and then they can put it on paper – that was fine. But not like um, like you see these assessments? They don't want this.

RB:

Yes, yes. I – I – I'm going to get to those assessments.

Teacher A:

So like we have this checklist. This is supposed to be our assessment.

RB:

That's more like an observation checklist, hey?

Teacher A:

So if you look at this, the page on one, this is supposed to be our, um, assessment, basically.

RB:

Ya. That's almost like from the guide, I've seen that.

Teacher A:

Yes. They give you a list of things and then you have to observe the child, and then we have an individual, uh –

RB:

Observation sheet –

Teacher A:

Observation that we do

RB:

The same for maths and language

Teacher A:

So um, this is supposed to be how – we’re slowly but surely working away so that is why we focus more on the concrete. And even in language we do – with each story we do a construction of um, were you here when they built the houses?

RB:

I heard about it, no, I wasn’t here, but I heard about it.

Teacher A:

In the beginning of the year, they um, we do the story where they sat with Allie and the paint, and the children have to make a present, because in the story there’s a present. So we do them like the wrapping they get, they make the wrapping, and then they take it home, but now we don’t, we’re – we’re working away from the projects being done at home, and we’re doing projects in the classroom

RB:

Definitely a good idea. And those, those assessments? Are those done devised here, or are they devised by the – the prescribed –

Teacher A:

No, we compile the assessments. But the assessments, um, are like each activity is – is on the concepts that they do, and the work that we’ve covered for the term. So basically, that was just an overall assessment, um, to test the learners on what they’ve done for the term, but that’s not what they want. That’s not how they – we, we don’t like – they don’t like the way that, um, you assess a child like that, because you shouldn’t mark a child, you shouldn’t code a child. You should make them like they’re competent or not competent, or if they’re still struggling or what have you.

RB:

Ja, it’s interesting

Teacher A:

So it shouldn't be coded as oh, you got a 7, you're the top learner, you've got the 5, you –

RB:

It's just um, either partially achieved or, ya.

Teacher A:

Yes. There are different levels of, um, especially with a 5-year-old.

RB:

So, what would you say is your most, and obviously I'm going to chat to all of you together as well, so what I don't cover today and sometimes what I'll do in the group chat is maybe cover something that you've already contributed to, so it's fine, you can either say you've already asked me that, or you can ... What would you say your strength is, what would you say you, your – if you'd think of, place yourself in the class, what is an aspect that you enjoy the most, or you feel that you are strongest at, or or... or that you kind of just warm too easily, and where do you think you're probably the least – ...

Teacher A:

Ok so ... If I speak about the psychological part, I just um, I love consoling a child. Especially the child – especially if our situation that we have right here - I like to - if I know a situation of a child. So I do have some that _____. So I do have children like a lot that come from broken homes, terrible backgrounds, and I feel that I – and I've been teaching now for seven years and I, I still have learners in Grade 7 that come in. And learners in Grade 5 that come to me.

RB:

Ah that's amazing

Teacher A:

Just to come and sit by me, chat with me. Because I like that I have that effect on them that they are comfortable with me that they're able to come and speak to me about certain things. I have a learner in Grade 7 who has been coming to me since Grade 1, she's been

coming to me every day. She can speak to me, but she can't speak to anyone else, she can't even speak to her own mother, so –

RB:

But isn't that amazing, and I mean, we kind of lose sight of that sometimes when we've got so many checklists and things. And you know, some of the hardest things of a teacher's role is, is you nurture these children on, and then they move off, so it's quite rewarding when you get that feedback, hey.

Teacher A:

Yes. And also what I like to see in a child is, I like to see them talking.

RB:

That's great

Teacher A:

So – so if a child struggled in the beginning of the year and uh, at the beginning of the third term, that child did a massive improvement – that – that makes me happy, to see that.

RB:

Like, for instance this little one here is coming along so beautifully.

Teacher A:

Yes

RB:

Shame, do you need to get them in yet, coz they've gone all quiet outside here.

Teacher A:

Um...

RB:

It's fine! We've done a few questions today, we can do a few next week. I've got to get through these questions but none of them are life and death.

Teacher A:

(Laughs) okay.

RB:

So, so, you know these are called loosely guided interviews, so like you have a general idea of what you want to ask – perhaps the only thing I want to ask from you to almost, or to get you to think about, not like, homework – I’ve already given you homework with your name. Which I’m still just giving you [redacted] for now.

Teacher A:

They all call me [redacted].

RB:

That’s fine. Is, is ... how supported in your role do you feel? You know, by your school, by your training, you know, do you feel ... how supported? And I’m gonna leave you to think about that, maybe don’t answer.

Teacher A:

Like do I get support from school?

RB:

Any support that you think you, you know – good and bad, so perhaps you do feel you are supported in some ways and not in others.

Teacher A:

When it comes to us, our, our HOD’s and our, um, principal, I personally feel that they, they’re very supportive with us.

RB:

Amazing.

Teacher A:

And even our previous principal always used to say that – how his Grade R teachers are his best teachers. Because we work as a team, you know, we resolve conflict if there are conflicts ... Never really happens

RB:

That's lovely. No, I can see you – you work as a team, you communicate.

Teacher A:

But we always, we try to work together and try to communicate with each other

RB:

That's amazing. And I mean, since I've been here I've always – and I remember the previous principal too – very hands-on.

Teacher A:

Very hands-on.

Unfortunately, he passed away.

RB:

Ya everyone seems very sad, they seem to miss him, hey?

Teacher A:

Ya. He was a very nice man

RB:

Shame. Well that's amazing, that's great. Well I mean I –

Teacher A:

We – we get a lot of support ...

RB:

Shame now you've already spent a bit of time, it's already fourteen minutes past.

*recording ends

APPENDIX L: INTERVIEW TEACHER S

RB:

So obviously I have to record it because otherwise, it's not research. So for instance if I say: I had a discussion around an assessment, and I haven't got a recording of it, not that they publish the recording but whoever's reading your paper, might ask you to prove what you said, so this is why I do it, but it's all anonymous. So basically, um – *interruption* – I try to explain to the ladies that what I do is just kind of, talk to you, hear about how you've come to this role because the type of writing I do for my research is not about numbers, it's about people, it's about stories, it's – it's called floral writing, it's like a narrative, it's not stories as in made up, but it's telling a story about people's lives and how we come together and how we influence with people, and what you bring to it and your struggles, and your journey and that sort of thing. Because who you are in the classroom, comes from – a little bit from where you come from in your background. So like all the others, I've just kind of asked them to start by just kind of telling me a little bit about you and how you came here – I know you were, um, so maybe you can just fill in the gaps. So you were in, uh, you used to fill in? As an assistant? Am I right? When you started here.

Teacher S:

I was, but my teaching background comes a bit, way back. So, um, we actually started from an Islamic background. I used to be a, um, Madrasa teacher. I used to work from the ages of 4 to, um, 16. So that was across, and then, I went to go and study my teaching, and I did ECD, and then I started at W in 2015 as a, yeah, I stood in for them. And then I would – whenever they had like someone that would go off for maternity or that, then I would obviously, you know, choose and ask if it's possible, and I'd always agree because I just loved teaching. And then, um –

RB:

Where did you do your ECD training?

Teacher S:

Um, College of Cape Town, Gardens campus

RB:

Same as Teacher A.

Teacher S:

Yes. Yes. But obviously, it was different years.

RB:

So what year was that? Because I used to see my Varsity College learners there.

Teacher S:

Um, 2013.

RB:

Ah okay, I would've missed you then. So it was 2013, and what – what is it, is it a two-year course, or?

Teacher S:

Uh, it's the 3 year, so it is the one and a half year, um, practical and then theory, one and a half years. N4 to N6 courses.

RB:

Alright, that's great. And how do you think that prepared you for here?

Teacher S:

To be honest, I was, I am still a very shy person, so, my mommy and I were having a conversation once and she's like: um, why don't you go into teaching? And I'm like – and then she's like: you're already teaching like, children, just not at a school or, like –

RB:

Yes, at your Madrasa. Do you still do that?

Teacher S:

I do. That's private, so I do like on weekends on a Saturday morning.

RB:

Shew, that's busy!

Teacher S:

So, and I was like no! And then she – but then she was like but you're – that would actually bring you out of your shell. And I was like: really? And she's like just try. And then I went, and my first time we had to have a – a meeting with uh – parents in the class, I was thinking of my mommy all the time because this is actually what she was telling me, like, it would bring you out of your shell, and you'd meet with people, you'd talk to a lot of people. And I wasn't that type, I was more like, withdrawn, maybe.

RB:

Oh, um – I mean you don't come across as that anymore.

Teacher S:

Not anymore, not anymore – it really did help a lot. It really did.

RB:

Isn't that amazing? I always say to my learners as well that sometimes the shy teachers attract the shy children and draw them out of their shells too.

Teacher S:

True! And I kind of tried, but uh – not necessarily, like, embarrass the children, or, um pick on them, but those that never like really answers in class. I try to – I try to involve them more, because um, I know the feeling of being shy and not wanting to answer and kind of hoping the teacher doesn't ask you. So, ja, I try to do that so that every one of them feels, like –

RB:

And it's kind of just the more you do it the more, the more comfortable you get.

Teacher S:

Yes! And, and I can see in my class, I can just see that, there are a few learners that were withdrawn, but because I involved them, especially in morning _____. Because that's where our active learning takes place, so, um, I involve them more during that time, and they just – they become more confident in answering, and –

RB:

I mean look how well they're speaking already and, in the space of six, seven months they're fluent.

Teacher S:

It's actually very, um, satisfying to know that what you're doing, it kind of pays off at the end. It really does.

RB:

Mm ... And this kind of your time of the year where everything comes together nicely now with the graduation, and –

Teacher S:

It is so smart, honestly, we've like now – I taught them the poem, so we've got like, just like six lines or four lines left of the poem.

RB:

How long is the poem?

Teacher S:

It's not that long. It's not that long, but it's uh – it's actually a very cute – it's like a promise, it's a promise to the teacher to do their best.

RB:

Oh how lovely! 'Coz now they are almost leaving. That's a hard part about teaching, is then you start all over again.

Teacher S:

Yes. This is – it's my promise.

RB:

reads poem aloud

That's lovely.

Teacher S:

Ya so ...

RB:

Amazing. Ya, I mean you've – you work as such a lovely team like I was watching you this morning and um, you know, you're a nice group of ladies that work together you know, you can see that you, that you're all on the same page, you work together, it's not like you're all on your own.

Teacher S:

Ya, it's actually very important because um, if you, if you now working with, like, you have your colleagues but this one is doing their own thing that one is doing their own thing, and you don't work together – it ... sometimes there can be like friction, it can cause friction, so I'm actually really happy for the –

RB:

Yes I agree, and I mean, I see that with my learners who have to do group work, when they do their own thing, when there are individuals that go off and do their own thing it doesn't work. It causes friction, definitely.

Teacher S:

It does.

RB:

And tell me if you had to look at your um harmony with working together. If you have to look at your job, what aspect of your day-to-day Grade R teaching would you say you enjoy the most? If you had to just ... So what is it about your job, that you – I know you said you find that it's quite rewarding in the way they come together, um, and come out of their shells.

Teacher S:

Ya, um, I think just working with children in general, being with them, teaching them, um, something new every day, 'coz there are those eager ones that, that that loves learning like you can see they're eager to learn new concepts, so, ja.

RB:

That's the beauty of Grade R.

Teacher S:

They're, um they're very curious to know, like. And because Grade R is more about it, it's fun. It's not, uh – there are, there is like structure in Grade R obviously, but I mean the, on your _____? Table, on your maths table, it's more concrete. So they can see those things and, they get amazed when they see, um, different types of, like when it was farm animals, all the farm animals.

RB:

And I saw them bringing it onto the mat and playing with the block play _____?

Teacher S:

Yes! And also, they, they had to draw what they see, right, where we do a story, they draw their favourite part of the stories, so.

RB:

Mm. There's scope for creativity as well

Teacher S:

Definitely, definitely.

RB:

And in terms of, maybe the least favourite thing?

Teacher S:

The least favourite thing ... Let me think about that. Um... *laughs* about the work, I'd say the admin.

RB:

Ya? Tell me? Tell me about the admin, it seems like, heavy. Even today Teacher A was saying you have to do, what do you have to do for –

Teacher S:

We have so much things, and we dread the end of term every time, because, it's just too much! Honestly, it's just too much, so you have new paperwork that we now got, we got new paperwork. So –

RB:

What do you mean by new paperwork?

Teacher S:

It's new formats, like of, of what we did previously, so, ja, like individual –

RB:

So like how, how has the format changed?

Teacher S:

Okay, not that much, but like, it was very confusing in the beginning, but, um, we have a really helpful and supportive HOD.

RB:

Is that, um, Mrs [redacted], no I mean, not Mrs [redacted], um, Ms. S.

Teacher S:

She is! Honestly, she is, and you can go to her for anything and everything and she'll be there for you, so ...

RB:

I'm just gonna call her Ms S., 'coz, you know, I need to call her Ms. S.

Ms S, how does she support you? Like how has she helped you with this?

Teacher S:

Um, okay, she – we had a phase meeting, she explained to us, look, um, so this is the new thing, the new format of the papers. You've got to fill it in this way, and that way, you're gonna add here, you're gonna add that ... okay. So we were now, we were set, this is how we – we got to do things. Then, um, later on, we was still a bit confused, 'coz it was all new to us, and then –

RB:

Like are there lots of numbers? Do you have to fill in totals for –

Teacher S:

She gives us the totals. So, she works out our percentages, so like our overall –

RB:

So-so-so how does she work that out, she gets those booklets from you? Does she get the –

Teacher S:

She – we give our moderated scripts, so I give my six, um, but she – I think she works from our mark sheets, so she gets everything from us, like our mark sheets, um, schedules, everything t –

RB:

For all the learners too?

Teacher S:

All of them, yes. And then she works out a percentage from there. *mumbles*. And then, um, she's honestly like – yesterday we even went to her and said like, we need help, we're really confused, and then she just explained it for us again. Like, after coming, like, maybe twice before.

RB:

So she's patient.

Teacher S:

She is, she is.

RB:

So what did you have to explain, like how to work out the totals or, like?

Teacher S:

Not necessarily totals, she gave us that, but it's just like, where we needed to, um, fit in exactly, like, for our language, all the concepts that were covered for language, what – like because of the space that was too ... that was too little, so she said just cover it over two pages like one for la –

RB:

Yes, yes – instead of squeezing it all into one.

Teacher S:

Yes, exactly. And then, yeah but, honestly she's really amazing, she, she

RB:

She's so helpful. She's very accommodating, I also, whenever I see her she's, and she's got her finger on the pulse, hey?

Teacher S:

True, true.

RB:

Now, I – one thing that I have noticed that I – I think you're kind of leaning towards too, everyone's kind of leaning towards it *interruption* – , is the admin around assessment. Every single – all three of you have alluded to that being quite, quite pressurised.

Teacher S:

It is. It is, honestly, it is. But, um, eventually you do get it done, you do get it done, even if you have to sit late at night, early morning, or, you know, after school, but you do manage to find, to find time to, um, complete your ...

RB:

Do you find it – it – it, um, it, um ... impacts the way you teach? Or ...

Teacher S:

Sometimes it does because it takes up your time. It does. But that is why I say like I come early in the morning so I try to, whatever I can finish, I finish early in the morning.

RB:

Mm. Before school? Like write-ups, or?

Teacher S:

Yes. Anything I have to do. And, um, and then also after school or when I go home then I take whatever I need to. Just to complete whatever I need to do.

RB:

So do you have those booklets for Life Skills, English and Maths? All three booklets?

Teacher S:

Assessments? Yes.

RB:

Ya.

Teacher S:

Yes.

RB:

And are those – they're your own, are they not the departments'?

Teacher S:

Not the departments, I own.

RB:

Okay. And do you do that in addition to the departments'?

Teacher S:

Um ... The – I don't think we get anything from the department, like any assessments, but I know we get the blue books. We get the blue books from them.

RB:

Don't you feel that if the department is asking for those facts from you, they should be giving you more guidelines? I don't know.

Teacher S:

I do feel that way. But, um, you know that is a discussion on its own, honestly, that is something totally on its own.

RB:

So you've just made your own booklets, you've made it work for you in the sense –

Teacher S:

Yes, but, in line with caps, and –

RB:

Ya I can see it's very closely linked.

Teacher S:

Yes, so, um, ja that's it ja.

RB:

And you assess every term? Right from –

Teacher S:

As the term, like – like, third term and fourth term, we try to do it, in a – not challenging, but just a notch up a little bit, because obviously -

RB:

– by the fourth term

Teacher S:

By the fourth term, yes, they're ready for Grade 1, but it's, but to be honest with you, we explain the lessons so in-depth that, you know it, you know? Because in the beginning, um, what I used to do was, I used to, um, I used to do the lesson with them. And then they were like, um, and then they said to me: no man, don't do it for them, just explain it to them –

RB:

And let them do it themselves –

Teacher S:

And let them do it themselves from the, like you know? And I was like, ja that actually ... and they're all these bright ones that just catch on.

RB:

They're lots of bright ones.

Teacher S:

Who catches on like ... at first.

RB:

And I see all three of you have learners that have special needs.

Teacher S:

... ja.

RB:

Do you feel that, um, you are supported with coping with them, or not – or would you prefer more advice or support? If you could, in a dream school situation.

Teacher S:

R, um, probably yes! Definitely, because of the amount of children we have in our classes, it's about 30 of us, there's about – this year we are 27, 26 –

RB:

Makes a difference having less, doesn't it?

Teacher S:

It does, but, because the amount is still that huge, you need to focus on every group of learners, there's not very much time to sit individually with that learner, that needs, like, that support. So, of course, we –

RB:

That's what my learners say too, 'coz you know, we push group work, we push group work and have individual time.

Teacher S:

Yes! That individual time. it's ...

RB:

Lacking.

Teacher S:

And you, you can't also push it till the end of the day because they play during the day. And they become tired too. They become tired. So, ja, that –

RB:

They become tired. So, you could do with a bit more, hey?

Teacher S:

Definitely, definitely.

RB:

And in terms of, like, intervention too – so you do the assessments and do the parents, do the parents get like, they do get input, hey? They get the reports, or –

Teacher S:

Definitely, like, each term, um ... so we have an intervention register, so, in the beginning, you would probably have like eight or nine learners on the intervention register based on the baseline assessments that you did.

RB:

At the beginning of the year

Teacher S:

In the beginning of the year, so ... And with their marks picking up it eventually – some of them come off the register

RB:

– come off the register. So they're nine per class or nine in total?

Teacher S:

No, no, no, I'm just saying that's, that's just an example, that's just an example, you can have –

RB:

Ok, so roughly there about – anything from – depending on the year

Teacher S:

It depends. It depends on how many intervention learners that – that you now assessed, and that you think need help with certain things, based on the baseline assessment. Then, from there they – now Term 1, we hand out reports then we have like a write-up, which – so my write-up would be, um ... So the child's name, the time, the date, the term. Right? And then, at the bottom would be my signature, parents' signature, and the date.

RB:

So there's a date to follow up on kind of thing, so you can keep a record of –

Teacher S:

Yes, so also, um, my write-up would be like, uh, what I see, the struggle with the child, and then the parents comment on that, like, if the parents gonna be more involved and the child will get the help needed. Things like that.

RB:

Do you make suggestions to them obviously?

Teacher S:

Yes, like because some parents are working –

RB:

Yes its hard

Teacher S:

Or like maybe it's their first child, and it's the first time they – the first time they're in a situation like this? So they're not really sure what to do. We do give suggestions on what they can do, and what measures they can take. But, um ... ja, then, they comment on that obviously, and then second term as well, third term –

RB:

Oh shew, every term then. Shew.

Teacher S:

Every term. So we talk to them, um, every term ja.

RB:

Do you ever get pushback? Like parents who say there's nothing wrong – or not really ...

Teacher S:

In most cases, like, my learner that I have, there's a sure sign of denial, um ... because, um, the parent spoke to me and she said, and she made no regard to like the situation, she just said that, um, it's her fault, that the child, um ... Because, if the child, if she wants to sit with the child's homework, or –

RB:

Oh yes you said, you told me she does the homework for her or something.

Teacher S:

Yes, or, um ... if the child now cries because she doesn't want to do anything, then she just lets the child go. She just lets the child go, and, she says, um, she's at fault in that regard. So no mention to any other situation, but also we can't just make diagnoses, you know, so.

RB:

That's so, that's so true. You're not the developmental psychologist.

Teacher S:

Definitely, definitely. So ... ya.

RB:

Ya. And I n-noticed – interested to hear that you say that that only starts formal intervention, that formal intervention only starts in Grade 1.

Teacher S:

Yes. They don't – they don't do it in Grade R because I think they ... they were talking about having it implemented in Grade R, but I'm not sure which year.

RB:

How do you feel about that?

Teacher S:

I actually think that that would be super great because, um, at a young age, the – like, at the start of their school already, but, also, I feel, that once they get remedial classes they must actually go up until Grade 7 with that.

RB:

Ya. Should be early and long-lasting –

Teacher S:

Yes because –

RB:

It's not a quick fix is what you're saying.

Teacher S:

Yes exactly. Because –

(22 mins) looks at time

RB:

That's interesting

Teacher S:

No definitely because if they, um, struggle ... like now already, and the workload is a little bit, and when they get to Grade 4, or, so, and the workload is much more, and they have social science, EMS, and all of that, arts and culture, it's a bit too much. And some of them maybe can't handle, on a broader spectrum, so, um –

RB:

I think you make a very good point, my son had to have – my youngest had to have an intervention, and I think he should've had it for longer. It was just too quick.

Teacher S:

Yes! Definitely. They sto- stop it at a, uh, I think they stop at a ... I don't – I'm not sure if they go up until Grade 7. Say, if – if I had to have an intervention in Grade 1, and my Grade 2 teacher doesn't do an intervention with me – how's that going to help? How's that going to help?

RB:

Mm. It's almost like, like a plaster that you're putting on and not, not ...

Teacher S:

Ya definitely.

RB:

Ya ... Um, and maths, per se? That's my, kind of, interest.

Teacher S:

Okay.

RB:

How do y- I mean, I know you do the morning ring, and and, generally do you find maths, um, is well mapped out for you? Are you given a lot of guidance as to how to manage maths in the classroom and integrate it? I see there's a lot of int-integration with the – with your playdough maths and your writing, emergent – emergent writing ...

Teacher S:

Definitely. Um ... Definitely, because, um, the – we do concrete, and concrete really, really helps the child, because that is what they see, and they can feel, so packing out, learning the value of the number, um, in –

RB:

In your little bottles I saw, your –

Teacher S:

Yes, even position of numbers, they can – that's also how they can learn because, um, middle, before, after, you know? Things like that, and I would say that our maths is well mapped out for us because, m, also we follow the R maths, and that is very – it's actually very nice. With the activities we do there, it's very nice.

RB:

It is, I can see. It's very well structured, and it's – it's – it's it kind of, they build on things, it's progressive.

Teacher S:

It is a lot though.

RB:

It is a lot.

Teacher S:

It is, it is a lot, but, um -

RB:

And do you think the Grade R maths, do they not give you advice on assessments? Do they just also give you checklists, or what?

Teacher S:

We do checklists, ya.

RB:

Like, they give you checklists, hey, but they don't really tell you how to assess, do they?
They kind of say what they want ...

Teacher S:

What they want, yes ... What they – what the child needs to know, um, then you just have
to tick yes, no, partially, like the child's in between, like they do know it, kind of ...

RB:

So, that's less number based checklists, hey? That's not like totals, it's just like yes, or
no, or, how does it?

Teacher S:

Yes, it's like you tick off, um, but it's like beginning knowledge, so, the child knows
numbers 1 to 5, they can recognise 1 to 5, things like that. They're questions and then you
now just have to ...

RB:

How do you feel about that tick list with competent, not competent?

Teacher S:

You know, I ... I'm not for ... but, I guess I think that - I don't even know what they do with it the next grade -

RB:

Do you mean with the checklist or the numbers?

Teacher S:

Yes, for the checklist, like, itself, because we have to too many things we have to write out, we have a journal, we have a – um ... a checklist, for language, life skills and mathematics, and, we have observation sheets, individual observation sheets for language, life skills and mathematics. Now, my thing is yes, in Grade R we just observe, also, but then why do we have an assessment also, that if we're observing, I'm not sure, but, its ... it does get too much sometimes.

RB:

It's almost like they need so much evidence, hey? Is that why you need the assessment, do you think, like proving it almost, or ...

Teacher S:

I don't know... but sometimes it just gets so much with all the writing and all that you need to do, and where in the day do you find the time to do all of that?

RB:

I know. I know ...

Teacher S:

'Coz you also have a family at home, and you've also got responsibilities at home, but I'm ... but I know it's hectic. Each grade has their own, you know, their own struggles and they have to go through but it is, it is hectic.

RB:

Sjoh. And do you see yourself staying here in Grade R, do you have a career path for yourself?

Teacher S:

I do. Um ...

RB:

Not that this isn't a career path, like is this where you see yourself? Or do you fancy a management position, maybe staying in Grade R, and being a manager, or would you – do you have aspirations to –

Teacher S:

I actually, um, spoke to my mommy, and, and I said to her, you know, “Mommy? I – I actually want to be a creative adviser.”

RB:

Wonderful!

Teacher S:

laughs And then she said to me, “So why *mumbles*, because you don't have the experience!” And I don't even know what you need to study, that –

RB:

But that's – that's lovely! That's the thing that you want to, that you're maybe, a future! And you're young. And you're ambitious. Look at how you've gone from not teaching, to assisting, to teaching now, to experience.

Teacher S:

True ...

RB:

That's amazing.

Teacher S:

That's – that's always been on my mind –

RB:

Just put it out there, you don't have to have a, set –

Teacher S:

It's really always been on my mind. That's, that's all I wanted to do ...

RB:

So you're quite keen to study a little bit more too.

Teacher S:

Definitely. Definitely.

RB:

Well, that's nice, hey. And you're young. Ah, that's amazing. Sjoh. Ya no, I mean I'm gonna, I'm gonna just, ya, I'm just gonna talk to you all in the new term, maybe, I don't know find a time, which, um, work –

recording ends

APPENDIX M: FOCUS GROUP MEETING ONE

RB: Okay, so, I haven't really, um, I haven't structured this like a focus group meeting properly in the sense that it must go where it must go, there's no like, set agenda, um, I don't know how well it's going to come out but uh, hopefully, I'll be able to hear myself and you. But essentially, like what we've discussed and what we've – what we've spoken about since I've been coming in is me just like observing this activity system and I actually brought you, much – is just a rough draft, I'm trying to design my own kind of diagram of it. Um, so this is like some of the theory behind what I'm doing – g. It's – it's – it's looking at sort of, just my own – this is just a rough draft. Um, so basically like, almost like a school is like a body, and if the body works well like, it's got to function properly and there are different parts of the parts of the body that – that make up a whole just like when you're sick, my eyes are itchy, when I still to feel sick, my glands swell up, I don't feel well, so. Basically, I don't look at one thing, I like at the sort of system as a whole. Just like when you were sick two weeks ago, it affects everything. So basically the one thing that I've noticed is that seems to be, um, possibly an area that we can kind of, come up with ideas on, is, um, assessment, because I've noticed you do a lot of assessment, and a lot of recording, um, and – and that is kind of an area where I thought maybe in the next two, three weeks, I can kind of give an example of – of maybe looking at ... From the way I see it, you're all very well trained, you know what you're doing. You're teaching beautifully, you know about play, but when it comes to assessment, you have to have these pieces of paper which are records. And, I kind of sense even from the way you talk to me, that it's kind of its – a bit sort of like you just have to do it? To have –

TA :Evidence.

RB: Evidence ... So I went up, um, two weeks ago to Joburg, I think I told I was in Joburg. I actually met with the lady who designed these books for another conference thing, but, one of the things I did is I spoke to my supervisor, and I said, you know the reason why I choose this school, is because it's diverse. We've got all the cultures and this is a social, cultural model. And the teachers here want to do good, I don't want to

work with teachers that ... don't really care about what they do. The teachers at this school since I've been coming here for years, they – they care about their jobs.

interruption

So my idea is to just, talk to you, and maybe give you some – some play-based, um, sort of ideas, perhaps of how you could possibly over the next while think about I'm – sort of improving on the assessments, so that they could be more, sort of child-centred, and easier for you to – to do. Obviously, you know, the reason why you'd have to do it –

interruption

Ya, so just kind of come up with sort of suggestions of – of – of things for you perhaps to just think about trying, that perhaps make your lives easier, because I said to my supervisor, I almost see this school as like a lead-teaching school on how to – to improve assessments. So, instead of me having to go through all the schools and seeing the same thing happen, I said well I'm gonna work with you and come up with these practical ideas of how to use play more, to assess. Instead of these endless marking, mark sheets, and give examples, whatever. And then perhaps even share it with, you know, there's a school right around the corner, here, that is, that are doing –

TS: And up the road.

RB: Up in the road! And– and for me to sort of say, well lets ... let me share what worked with these ladies, and so use you, as a kind of design model, to – to improve assessment. Because certainly, from what I'm reading, from what I'm seeing, this assessment is weighing you teachers down. Its – it's just checklist after checklist, I don't know if this is where you – I just want you to think about it and talk about it and talk among each other. They're not huge things. You know obviously I would never suggest anything that I wouldn't talk to you about as well and say look, we're not changing anything, we're just looking at smarter ways of doing it more effectively, maybe in groups. I've seen sort of opportunities where I think it can be done, I've got, you know, and I've got suggestions perhaps you'll come back and tell me you know, that's crazy, but then that's fine, then I'll write up a final, and say this is where we're at. It's not easy to, you know – it's not like I'm going to wave my magic wand and all these issues are going to disappear. So you know ... this is like, where we work as communities of practices, it's not me saying I know better and you don't know anything, it's you are saying: well actually you think

you know better but actually hang on a minute, this isn't gonna work, or maybe this will, and we can just tweak it. And eventually, you know, as you start doing these assessments, you might think, hang on, I can also do that there, or there, or there. So that eventually we come up with a more – a more suitable way of managing assessment with the needs of this community, that works with what challenges you have. Time is another challenge here, definitely. I mean, you really do struggle with having even a minute to spare, you know, but really that is ... So, the two sort of – so how this activity system works, is when something is out of balance, then everything starts to kind of – and at the moment, I think the out of balance thing is the time and the assessment, its – it's really weighing quite heavily on you. If you're not doing your beginning of the year assessments, you're doing your termly assessment. So, I kind of thought, well, you know, we could sit as a group, and I could say well here are the things I've seen, here are small suggestions I've made, uh, you know, even if you just practice it as a – as a non-assessment, that doesn't go in their file, see how it works, can you actually assess like that, does it make sense ... Um, and then I write up about it. And you know, maybe if only three or four things change, you know, we can start sort of just looking at what is it that stops us –

interruption

– so that's essentially where I'm at, it's not a case of me saying that what you're doing is wrong, it's just a case of it being quite hectic, for Grade R. Certainly when I – when I think about what you're expected to assess and teach it's quite a lot. I don't know your feelings, but, I – I – I've spoken to you, and I've spoken a bit in our individual interviews on, um ... And I think there's also this – also, I think you – you know, through us maybe having group chats and coming up with some ideas, I think you'll – I get the sense that you don't realise how much work you are doing, and how much learning is taking place here, you almost – there's almost the need with earlier grades, almost to prove that you're working, and have this evidence, meanwhile, actually the proof is in the activity. This is what this thing is called, it's an activity system. It's – it's when they're active that they're learning, you know, and then you do these assessments that come afterwards. So ... And if you look at the checklists at the departments, we have a meeting at this Indaba with those checklists, they are very difficult to do. You know? So maybe you can, you know, talk about things that you're struggling with, and I can go away and think of ideas. And you know if I just come with maybe five changes that you could try out, not I'm saying

with this class because it's almost the end of the year, but even with next year, we can talk about it and say well this, you know, and I'll meet with you early next year, and you'll say well, this has really worked nicely at the beginning of the year, or, yes, I can use that, or no I can't. And – and we kind of talk about it, as – as – as people in the practice, who all only want to, um, work for the better of – the better of the kids. 'Coz I'm also getting a sense that the department wants all this information, but then they don't intervene. So you say that's where they're at. And there's – how can we fix it, you know, it's kind of, that's where they're scoring, they're scoring a number and then, you know. So, that's essentially, you know, just small little tweaks, um, and then writing it out, and saying well these are ideas we've come up with, perhaps doing a talk at another school, um, you know showing them h – showing them examples of how we were smarter in the ways we assessed, you know, and – and perhaps have evidence of a different nature, maybe even, um, not individual things but photographs and stuff done with checklists, you know, where you could go round. The one day they were just doing, like, showing of fingers, and, you know, matching – there was so much learning taking place, and then you go and do it on the worksheet and it's not quite the same. You know, so ... So that's essentially – you know I spoke to them about it and I just said like, I think you know, we can really make a difference, because no school I've been to, I'm talking from the schools that are private to the schools that are – are funded solely by government, fee-paying schools, non-fee-paying schools – no one really knows, like, what are we supposed to be assessing, and how do we – it's – everyone just assumes that we all know what we'll be assessing, we talk about play and that play is so important and then when you come to assessment, it has to be like a tick-box thing. So like kind of, to me, that is research is about, it's like saying well this is what we're seeing, and there's a gap here, and no one really ... you know. I know you – you – you've got your lovely, um, termly things, but I'm sure you could also do with a bit more sort of, like, maybe a bit of advice about – well it's a lot of marking, hey.

TM: We did see, – we did – we I think for the past term or two, we did improve more, um, concrete, um ... I know in the past we used a lot of worksheets mostly, but we are trying our best now to *interruption* – change, if the lesson is ... we'll focus on for example, measurement, then at least two to three of the group activities are concrete, and one, which is now the written, and the evidence, obviously it is seen as evidence that the learner has got it.

RB: Yes I saw that, with the lovely little yogurt cups, and that, with the sand and that, you know. So maybe, what we could do is just kind of put our heads together with how to make that assessment of that activity. Less paper-based, the actual assessments ...

TM: It is very formal, and I think in the past we also had when – when we get visitors, um, department visitors, where they also feel our stuff is too ... for example, too formal for Grade R, but um –

RB: They probably don't give many examples of how else, because that's what I'm hearing, like they'll say things are too formal, but then they won't come up with ...

TM :No, no, they – we must – they don't want too much, um, worksheets, it must be more concrete, but I think in this, like I said for evidence purposes, uh, my HOD *mumbles* for the number operation, concrete, that was just evidence for her to see – for us to have

RB: No definitely, there are some sort of aspects that, you know, are absolutely fine, you need that evidence.

TM: And I think our booklets used to be more, we used to have, if we do number operations, we might have two or three activities in that, but now overall for one content, we might just have one as evidence, because we feel we need enough concrete so that we are able to ...

RB: Exactly. Ya, ya ... So, I mean, I don't have, I mean, it's not a case of me coming down and saying what you're doing is wrong, it's a case of just saying: jeepers you all are working really hard, is all this – this assessment? Is it helping? Let's look at the kind of things that you're assessing. I've got a couple of examples that I can bring in and just show you, and then you can just reflect on it. And then, you know, use it, don't use it, feedback to me and say well actually I tried that and it worked really nicely. Another – another thing I really hear a lot of is, that the – the – the older learners come and visit you sometimes, in the classroom. So I kind of wanted to think about, how often do they come, when do they come, can they not somehow, I don't know, work with checklists – where you sit with them and tick, tick, I don't know, are they allowed to? Or do they just come randomly?

TS: It used to be, but they'll just come pop in, and yes, they'll come sit in. And I do have one or two regulars that will just, but, not really ...

RB: I just think we, ya, we need to just find ways of making your life easier so that you can have more time to do what you want to do, which is teach, and not just – just ... mark.

TS: But I do – I personally feel that did change a lot, hey. Don't you think? We used to have similar kind of marking that it feels

recording jumps

TM: So the main thing is admin, like your checklists, your observation sheets, that individual observation sheet. Um,

interruptions

RB: This is what I'm saying, and if you take that in with all that you're doing, I mean it's ...

TM :It is a lot

RB: It's huge ...

TA: Coz we have – we have the j – the journal entries on its own.

RB: Is that for the WCED?

TM: We have – we keep that as proof, but we do get visitors, we have a little write – even like for so –

T S: But that's for heavier problems also, and

TM: Or even written proofs – or I just see, this child's letter formation is improving and then I'll write with it, hey. Um, __ handwriting, I can see an improvement with the handwriting, so that's our journal entries. Or maybe a little incident, maybe the transport was late, or the child wet himself, we'll have that as evidence.

RB: Ya, so those are like, your sort of flagging, like –

TM : So we have our journal entries, we have our individual observation, where we have headings like, um, learners able to retell a story. And then, what I observed after doing

my lesson, and I basically – each child has – when I say this learner maybe, um their listening has maybe improved, or their listening is still – their concentration span where the learner needs guidance for retelling a story, or the learner relates knowing that one – we have a tick off checklist that I do – that's the one that I do with the department one that we – ya ... the one [redacted] gave us.

RB: Do you do that every term, hey?

TA :Every term, ya. And I think that it has become so a norm for us that we –

RB: Like for instance, I ... like the symmetry one, you did that lovely symmetry activity in the book where they had to complete their faces, but then I felt, then I saw the other one in symmetry which was drawing the other half a very symmetrical house.

TA :Oh in the assessment?

RB: In the actual assessment, and I kind of looked at it and thought how is that really? ... They scored most of the learners very low on that because ... to me I looked at that task and I thought: let's look at – most of them come from very informal homes, its not a home that they can – maybe they can draw their own homes, maybe they can make a home on the map that's symmetrical, with blocks. You know, and – and – and you actually use that as a photograph of understanding the concept of symmetry, because that task in and of itself was quite formal. I mean I actually looked at that house and thought I don't know if I could actually –

TS: True, I actually think when we had to, then I also think that –

RB: You know, so it's not me judging you, it's – it's just coming – what we call it is myopic vision, and sometimes when you work so closely to something, you can't see it. Not because you're wrong, not because you're bad teachers, just because it's what you do, and you think this is a good idea, then I looked at that mark and thought how that mark would bring down the average for maths, for the whole term. So you know, little things like that, and sort of saying, well actually let them, let them draw their own home, let's talk about shacks, let's look for shapes in shacks. Shacks are not symmetrical, you know, and this is where the social, cultural model comes in, because if you have a house like that, which no one – very seldom sees, a house that's symmetrical, then you can kind of think, well what is symmetrical? Your faces, your bodies, let's do something in art, or

let's do a bit of block play and actually just take that picture and say there's your knowledge of symmetry. So you know, I'm not saying like huge changes, but just here or there, kind of, just using the learners culture and knowledge to – *interruption*.

So you know, that's the kind of thing I thought, just like, you know, it's not a case of ... – just showcasing how we can do this, how – how we can make it work in Grade R, and incorporate play, because CAPS talks about play-play-play, and we know that we must do it but, suddenly when it's time for assessment, play goes out the window and then we sit with an assessment that probably isn't that – I mean you have to have evidence, but it isn't really assessing, really ... I mean, to a certain extent, like things like you said, like being able to count dots on a page on know that that's four, and identify four, there are certain numbers and operations things for sure, but I don't think everything can be like – the concept of symmetry is quite complex. To be able to just take it off a piece of – one drawing, you know, so it's – it's – it's not a case of pulling it apart and saying chuck out everything, it's just a case of saying well actually, this year we're gonna put this one in instead. And we're gonna change this, and this is why we're gonna change it, because we – we understand how little children think and move and experience their homes, and that kind of thing. So bringing in more of a social element, um, which you do in all your stories and everything, but it's just kind of – kind of looking at things as – as me as an outsider. Some of the stuff I'll come up with you'll go “that's crazy, you have no idea! You come here for an hour a day and then you leave, you expect me to do that”. Or maybe you'll be surprised at something I suggest, kind of, you know, even like the symmetry thing, you know what I'm saying, it's not a case of me saying it's bad. It's a case of me saying: well lets – let's look at ways of working with what they have, um, what their ____ um, it's just one silly example today, but, I don't know, that's where I think I'm going with that, um

TM : It's true, even with that in my teaching prac, I was doing also doing a symmetry, uh, lesson. And then the actual lesson that was given on the page was actually for the highly gifted learner, that was able to manage. All the other ones and another. Play dough, the sand tray, the fern tree stuff, just so the learner that is more advanced, would get the – handle the actual activity. Not all, because they all learn differently, they're all at a different level. I – I kept on saying

RB:

And even if you had to build a house, out of Lego like that, I think you've got more chance of them being able to build that, you know, and just taking the odd photograph, you know, and saying, you know, this is our evidence, you know – you know – there has to be some kind of trust that some exercises – you can't record them.

TA: Yes. I do a checklist even if – the checklist is supposed to be your evidence. If the learner must now say, must build a symmetry of the house – so with the checklist, you will just tick it and tick as the learner was – let's say the learner wasn't able to and –

RB: And – and you know, if you want to maybe for your files, have a few photographs of kind of things you do, and, you know, and – and I – you see where I want to come from is, is not knocking you down, and empowering you, and saying, you [gender] know what you're doing, you stop being scared of whoever's coming to check you, you've got enough evidence, gosh! You've got more than enough evidence that you do enough work. It's more a case of listen, we are experts in our field. We are doing what we are required to do in terms of where the learners at. Where's the play that you are telling us, you want us to do concrete, you want us to do all these things, but then you want us to have evidence. So, yes we'll have evidence. But we won't have this unnecessary evidence, and where there's better ways and smarter ways that are more learner-centred, we're gonna just slowly, slowly steer within that direction. So it's not like we're rule breakers, you know, just – just subtle little changes, um ... And through the – through you being able to justify and say well listen, this is not child-centred, or this we've decided to do this way, you're actually almost saying that you – you're evolving as – as – as teachers, and you, you're listening to their needs and that. So, I really can't tell you that – how often I think about you and how wonderful you are in the work that you do here. It's a very tough job, and people who don't understand Grade R don't realise what goes into it. So I sort of come as a sort of – you are experts. And that, you know, we can – we can make you top of your game. And kind of really just, um ... not in a bragging way, but, you know, we can write up a lovely example of how we can constantly improve our assessment, and – and that you know, teachers don't have to, um, throw out, you know, what's that saying, throw the baby out with the bath water, you j – j – whole new bath, y – you just take it and you work with your documents, and you work with your learners and you kind of make it work for everyone, so that's kind of where I think I'm going, so like I just drew this up for you. Just kind of, so you can see how, like, for instance if you – if you look

here, we've got – we've got the object, the outcome is your little learner, so here's your little learner, a – and what they benefit from the assessment, and school in Grade R. Then you've got, you know, you've got yourself and your community with your rules, and your HOD's, and your family, and all of this kind of a push pull on you, and where do you fit in, you're the teacher here. You – you – you're kind of in this system, and it's like – it's almost like, if you imagine a spider, in a web. And you pulled this way, by the rules of the department, then pull this way by what a parent needs, pulled this way by what the kid needs, so it's this web of – of – of activity. From which you exist. And – and – and, um, like your rules and your instruments are pulling at you from both ways. So you've got your rules, we've got a checklist, but you've got your instruments, but they can't – you know they can't copy ____ properly, you know, they're still in Grade 1, you've got to have symbols and names, and it's like – its constant tension that exists. So that's – that's why I gave you this today, to kind of just look at ... you can keep it and just throw it away, I mean, I've still got to do this in neat anyway, but this is how it sort of sits.

recording ends

APPENDIX N: FOCUS GROUP MEETING TWO

RB: What worries me is like how this will work for them. It's all very fine to video this and say it works but if they gonna carry this forward, how's it gonna work for them? They going to do play based assessment how's that gonna work for them? So he said to me well have you spoken about the ZPD? You Vygotsky I'm sure you've heard of him so like where you at compared to where you want to be it always seems unachievable in the beginning like the goal of play-based assessment obviously it looks difficult to get there but if you start by saying what if play an assessment are not separate so I said can I make a few suggest. What worries me is like how this will work for them. It's all very fine to video this and say it works but if they gonna carry this forward, how's it gonna work for them? not separate so I said can I make a few suggestions so he said well if you're going to make the suggestions and your suggestions are not their suggestions so his feeling is that there's no point in me coming up with this is what you must do then he says it's taking something external and just putting it onto you. I rather workshop with you and hear from you we can maybe together come up with a more permanent solution so essentially saying Don't force the issue he wrote down for me which concept would I use to lead the process towards possible alternatives, so I said I'll be working within that activity system that I spoke to you about do you remember that I showed you that triangle and I compared it a bit to a body as a system that works

TA: Agree, agree

TM: Okay, I'm going to Answer to our understanding we do assessment with play based with the concrete is being done the actual activity that's being done. I can understand saying that we must avoid that but that is done basically as an end result as evidence don't want the final result as evidence.

RB: Well, it's not that I don't want it. I just wonder how it speaks to how they are doing accurately. I wonder what they actually know in terms of like you get to know your learners and you probably know them better than what those worksheets are telling you so how we can work with assessment and play together and not have them separate. They are no schools that can properly explain that I have visited that can explain how

they are doing play assessment other than worksheets. No schools so that's our model to create play based learning with somehow we create together. Have some evidence, but maybe we need to examine what that evidence is so that's the idea of the workshops. It's not the idea that I have the answers if I had the answers I'd give them to you and if you had the answers you'd give them to me but this is what so amazing how can we create assessment in the class? That is really accurate? Remember the time I spoke to you about how a child writes a letter on a page and you assess letter formation but you haven't actually seen the child writing the letter. How do you know the child can actually write the letter? How do you know that the child doesn't skip a step? Sometimes the assessments don't speak to the skills so what I'm suggesting is that for the duration of the next term, I just pop in see how things are going seeing the kind of things you are doing you see that how things are going. It's not a case of throwing out all the worksheets and starting from scratch. I looked at the worksheets and I kind of made ideas and colour coded them according to the different learning areas and I kind of looked at perhaps a couple from each term to revisit for instance didn't look at any from term one because they are so new but for instance the ladybird worksheet one spot to one, one spot to two.

TS

TS: Yeah, that is in the assessment booklet

RB: Even getting you to think around that

Teacher A: we spoke about that assessment now I was saying like that child is going to see two spots and automatically think I need to draw two spots. I'm assuming that is what they would think then I come and say not only draw one spot and then we leaving them with the confusion of why one? I'm not sure if you understand it like I do?

I do

TS: We were actually having a discussion on that

RB: Yes, I saw that and I think prof is right in what he's saying It's kind of like my son. He's always late in the morning and leaves his room in a mess but if I keep tidying his

room every day for him, he'll never learn and figure it out for himself. I don't want to have wasted your time in terms of your growth. I believe in the school in the diverse context, I do believe we have the solutions and I know we can come up with something. The fact that you've even thought about this after I've left means that you kind of know that it's the right thing in terms of what's best for little children like nowadays, this new thing of ChatGPT is the buzz word so what I'm saying is moving into world with assessment is not gonna be done the same way

RB: I don't need to go to any other school. I want to work with the school and we're going to find a model for play based assessment. Just maybe you open your eyes up to possible ideas, to looking what the motive is for instance in the circling worksheet what is it that you want them to do and how can we find a way of doing that? So what are they learning from each other? You don't need a worksheet to assess that.

John Mason wrote about creating a motor for learning and he used all tobacco tins and he put little blocks inside them like two blocks in one three blocks in another four and another and then he mix them all around and you would ask them which is the box with full which is the box with two and they would guess sometimes they be right and sometimes they be wrong and he carried on. But eventually the children came up with the idea and said can they write on the outside of the corner of the tobacco boxes to make it easier. So you almost created in need they looked in the boxes and then they knew what to write, some even wrote the numerals three others drew three dots so the point is he could see that they knew about numbers without having to do a worksheet so like I don't know let's just see where this goes? See if we can think about it don't think about answers now think about what we want, the most important thing is to find out where they're at and strongly push the idea of teaching and learning playing assessment they're not separate things

Teachers: Agree

RB: The hard thing is, how do we record? How do we notate it? that's why I think this is going this year it does not matter. It's not just about the children. It's about the activity system as a whole what are some of the struggles we going to encounter time

issues? There are huge factors so one of the huge things are spoke about time is a resource, this is just what I wrote summary of previous meeting provided suggestions so he said well if you're going to make the suggestions and your suggestions are not their suggestions so his feeling is that there's no point in me coming up with this is what you must do then he says it's taking something external and just putting it onto you. I rather workshop with you and hear from you we can maybe together come up with a more permanent solution so essentially saying Don't force the issue he wrote down for me which concept would I use to lead the process towards possible alternatives, so I said I'll be working within that activity system that I spoke to you about do you remember that I showed you that triangle and I compared it a bit to a body as a system that works

TA: Agree , agree

RB: So yeah he said that idea of moving forward the idea of creating a bit of a disruption not in a bad sense. I just creating a sense of change small disruption you can get growth so I think I looked at that triangle again so the subject is you the object is the learning, your teacher knowledge your things that you bring to the classroom your apparatus we have got your community which is your department that you work in and our dream outcome is where assessment and play become one.

This is just what I wrote for your reference The researcher requested a meeting with the principal and started the meeting by discussing the strengths of the grade or teachers regarding their professional and considered approach to their teaching an providing meaningful play based experiences for the grade our learners. Challenges were raised such as language and cognition, little support (in other words you're not getting much support), lack of time and space and resources. it was said that in spite of these limitations, there was an element of play in the classroom culture. The researcher then went onto discuss areas that needed more to align with play-based pedagogy, and the more formal style of assessment booklets. The researcher proposed changing and adapting, starting with, changing and adapting five assessments for the year one from each of the Maths content learning areas.

The suggested changes would align more with formative play based activities That were more matched with the needs and capabilities of the grade R learners. Through the process of the interviews the researcher gauged open the three teachers were to change and show no resistance to the reworking of the tasks. By starting with just five areas, the researcher hoped that this might impact the nature of further assessments in the learning areas. Furthermore, the outcome in visages that the teachers might become empowered and inspired to change additional assessments on their own.

That's kind of where I'm at. I was kind of hoping you could just do some things and I could write it up and I could be out of your hair but he is saying no, no let them sit with this- not that they need extra homework. I know how busy you are don't feel like we got to sit and workshop together daily activities maybe think about it maybe I'm assessing another thing. I read about this research called a change lab it's called a research design experiment with a researchers go in and then look at how our business has been run they did it with the postal services, because all the postal services workers were being discouraged because everything was becoming email-based so they had to come up with more creative ways of how they could enhance their work profiles these research just came in and workshop let's look and talk about the things that they struggled with and what they can change it's cool to change so what was quite useful was the statement?

What if so like what if I just look at assessment?

How I informally assess and reflect on that if I look at one task and you look at another task and come up with a more play, based version of it. What makes it more difficult because that's what I need to write about. activity system is not perfect we know our body is not a perfect system. like what is slowing our bodies down where do we need to put more focus on?

I'm not asking you to have a perfect play based learning situation but we are working towards play based learning, so that so that if it doesn't work, tell me so we can find out how to fix it. Like the CPD so we're here and we need to be there so how do we get there? We want to be there. What can we do to get there? It's a recursive loop it's not a straight linear

TM: Yes, agree

RB: It might seem so meaningless but one day scholars can read about a school that made changes. It's a big ask but I think the school is the right, the staff are committed the learners are diverse. It's a lot to think about.

TM: So miss, I just want some - some clarity so Miss is not "for" the assessments that we have

RB: I don't think that I am against it, per se I just want you to look at them and ask yourself are they accurate? Are they fair? For example the one that we looked at? Remember the symmetry exercise?

TM: Yeah, there were a few hiccups there

We also do use like we have the journal entry and we had a checklist as well. The child's final mark is not just based on the assessment. It's based on the overall it's ongoing.

RB: That's fine I'm not anti the booklets, but are they actually accurate?

TM: For example, let's say with number two so the child gets an opportunity on the mat to count with the actual objects with the number the number name they also have Play-Doh with a template they form the number two so it's tactile they have to roll two balls.

RB: Yeah, I've seen those. Those are amazing.

So what I'm asking is...That is closer the line with knowing the tunes of two than the actual worksheet

TA: So our aim in how we work that we have all those stations, but eventually is going to get to that worksheet. So practice make it fine and then get to the worksheet. So the worksheets don't stand on their own, So they can hop into two hula hoops

RB: I need to come and look at the journal because you're right it's not a one so formative. I just noticed there were lots of marks to those last worksheets. How are you? That Mark is actually then like how do you know their own copy when I go to dance class? If I don't know what to do? I copy someone. That's the ZPD. So you needed the help in the zone

of proximal development but you've had that help and you can do it on your own learning from the teachers and then you can do it on your own. My point is also that how do you know that they know stuff when they're sitting next to their friends.

TM: Yeah, we do notice that their eyes are moving and then we move them to another spot

RB: So what we actually saying is it possible to focus more on what they are actually doing like the time when they came to play on the mat with the blocks and they had the farm animals? They were actually doing one-to-one correspondence they had one block and a triangle for the roof, so they were so much knowledge and chatter there, that's where the knowledge is. That's where play is

TA: The thing that I've noticed over the years with some learners when it comes to play based they excellent but give them a worksheet the mark would then drop but they can do it practically and vice versa some good at working but put them on the playground and some struggle

RB: So that's the kind of thing that's really interesting and the thing I want you to observe in your practice what is it that they good at? How can I use to assess to say that there's no space for worksheets reality is we are at school and we do need to fill things out so...

TS: Yeah

TM: You even with me, I have one or two learners that are very verbal but if you see their work, you won't say it is they said that same learner. They verbal and they can answer, but they're nothing on paper.

TA: Yeah, so maybe it's The putting on paper. That's the problem. That's just one element the fact that he can't put it on paper doesn't mean that he doesn't actually know.

TM: That's where the journal comes

Yes, that's where the journal comes in. I don't know. I have a suggestion. I don't know how the journals look.

RB: Certainly I don't want you to worry after today that this is a huge task that is unachievable so we knew where we were going. We would go there but this is not the point of this research. We are pushing the boundaries. Let's think about all our practices, let's think about the needs of the learners. Let's think about language that's another thing that's coming out strongly I noticed when they go to the math they're talking their own language a lot of thinking going on there almost there needs to be almost probing what they are speaking about. What are they learning about? What concepts are they discussing? actually doing maths on the mat, you have beautifully structured tasks but often the play tasks could be pushed a bit further. For instance instead of just the scale that you make you give them things to work within their play to make up a story with animals in the scale. For instance you search in CAPS it is play, play, play, play. There is assumption that everyone is expected to know what play is don't talk about what to do with play, like just go and play. I want you to tell me a story about the animals on the scale. Tell me about the animals you see I want you to come up with a game so kind of direct play worksheets can consolidate in your mind. Are you assessing through play throughout the day and at the end of the year, I know that isn't strong through this but through their play and the interaction and their verbal understanding as the educator don't accept that the school should just be a three because I've seen evidence of play I've got my journal entries

Teachers: Agree, yeah.

RB: Enough, let's chat again soon

APPENDIX O: FINAL FOCUS GROUP INTERVIEW

RB: So we have kind of come full circle now. I was watching the graduation video again.

TM: Oh, we busy now. It's that time of year again.

RB: Oh sweet. Are you doing a similar format?

TM: Yes, more or less. And um.

RB: How do you think you are now looking at ... at fewer assessments? The ones you revised. I don't know how if you have any time to talk about it quickly now. Some of the changes that you made. You said you'd kind of re-looked at some of them. Simplified them and changed them.

TM: Yes that is something that has changed a lot.

TA: It did.

RB: So can you maybe give me some insight into some of the changes cause I kind of left you just to kind of figure it out.

TM: For the assessments. I think it's kind of. Not based too formal. Where the marking is concerned. It also gives space for you as a teacher to like maybe you know that the child might be able to do it concretely but maybe not on the worksheet. So um you as the teacher. Can give your own input.

TA: And also our life skills now is also based on. More real-life experiences. So like this term we are doing a morning routine – routine with the kids, like a sequencing. Like you wash your hands like something that they can relate to. So we don't assist them before we have a full discussion. We discussed things like what do we first do if we go to that tap, or do we need to rinse our hands?

RB So you saying you pre-empting assessment with real-life experiences?

TA: Yes, it's more focused. And with regard to the less formal marking.

RB: Do you feel that? Like on those worksheets. Do you write notes? Like you said, you're doing things more practically, so how does it work? Like you're not going by the rubric so strictly anymore like you used to?

TA Can't exactly measure them. How many marks?

No, it's not like that. Like remember we used to have the rubric one to seven. And we'd circle it. Well, we don't do it like that anymore.

RB OK. So that's kind of like? So it's more guided by what you've experienced.

TA: Yeah. So now we did the life skills one. So basically when we do the assessments, we think of the child. So say now we have five columns, say 1 to 5. So one would basically be. That the child would basically need assistance. So we will state in there. That the child is unable to complete, so teacher assists. So that when they moderate. All they look at it and stuff. It is because we had to assist the child. Not necessarily that the child is failing, it's just the child needs more assistance.

RB: And has it made things easier for you or is it just better for the child?

Or has it made more work for you? Um I wouldn't say it's more work, I must our intervention register. We have at the end of the year is less.

TA: I think I have one.

TM:

And I have none. And Mrs S has one. Although I don't have anyone on the list, I do have one or two that are still assist because I feel that they do need the extra guidance.

RB: If you compared it to in the past, would you still have quite a few on the intervention register?

TM: Yes, by this time we sat with more than five.

TA: But it's like we've always been doing concrete, but now this year I think our emphasis is even more on concrete. For example, with that spatial assessment. the symmetry one we're doing where we also doing the physical, we're also doing the concrete. The physical like Is the child able to do this. With ... the body?

TM: Yes, And, bricks and things.

TM: We've also been using a lot of concrete like puzzles and playdough.

RB: Like your lecturer commented on.

TM Yes, he liked the concrete.

RB: It sounds like you're more confident. To say like we just not relying on worksheets for everything. We're going to do more concrete. Yes, they have their place, 'coz you know, they're going to Grade 1. But you're saying it's not everything. Are you finding your sort of now? Feel more confident? In the way. You approach your assessments.

TM: Yeah. And I think even our HOD. Likes the way all stuff is set up now.

TA: She was also happy with the changes that we made. In our assessments.

RB: What kind of what did she like?

TA: More learner-centred? Like. We will send her our marks. But we will base all marks. Assessment marks. On the concrete. On the Listen. So we would state that in the instructions that we give along with also with that. We refer to. Our journal entries and assessment checklists.

RB: So does she get to check those too?

TM: Yes, they get sent with them, they also count as evidence.

RB: And your learners this year, how have they cope with this?

Do you think they enjoy the concrete stuff more or is it the same as the worksheets? Or do you think they just cope with whatever you throw at them?

TM: I think my children. I refer to my girls. I know my girls. When it comes to the worksheets they. They work so nicely. But I think my boys prefer the concrete more. And class size, has it remained the same? Have you got a teaching assistant? Yet?

TM: No.gap. And then no repeats this year.? No one stays back in Grade R.?

TM: No.

RB: That's interesting. Certainly when I was teaching, Grade R was the year with it. Say let's just have another year here.

TM: Well, I actually spoke to one of the Grade 1 teachers and we had a conversation about that. And I actually told her that I personally feel that when look when it comes to

children starting from the age of one. A developmental stages are not all the same. And sometimes they need that extra year. In order to get onto that development stage.

TA :To be on the same track. Like sometimes. They come to grade or because of their age. And not because they school ready. Like I have a child in my class ... [name omitted]. Like, she works well, but she's not ready for the school environment. Yes.

RB: Yeah, I see. That is an important aspect. Interrupts.

TA: Like she's still ...

TM: It's like the Grade R point has got lost.

Like if you look at our work our curriculum. And the grade one curriculum. It's completely different. That's why all kids struggle. We focus on the objects. Counting with objects. They will also do that, but just focus on the value of. The number.

Like Grade 1 is $2 + 2$. Like they focus on the answer Cardinality? In terms of writing the days, the dates, the sentence is. And stuff like that that we don't really focus on. Like we don't really focus on writing sentences with the kids. I don't think you really should.

TA: Like you have a handful of the bright kids that will be able to do that. But. Not all of them are there.

RB: And this little girl that you mentioned. What does she lack? Like social skills?

TM: She works OK. All the work is right. But like, she's in her own world. Like she's literally in her own bubble. Like I spoke to her mommy, Mommy was also concerned. Like a mom has to constantly talk to her all the time. Like she doesn't know. About putting away things. She doesn't take pride in his stuff. She doesn't know if her belongings. Sometimes she doesn't even know. What belongs to her? She's lost Jersey. She's lost jackets. She lost shoes at school. She lost lunch boxes. She also doesn't mix well with the kids. I took a short video of her. While she was working with the kids and I showed her mommy. Like when she works, she doesn't make a sound, she concentrates.

RB: And like in the past. When you had those interventions. Did those interventions stay or did they go up

TM: No, like those little lists go up.

RB: So they so they get supporting Grade 1. Yes, support continues. We do have the extra support teacher who comes and fetches them from the class. The teacher in the prefab?

TM: Yes. .But they don't come in Grade R. Not for testing. But the one teacher has been coming to do a bit of work with the children, like we had someone come and do Jolly Phonics. Introducing, you know, hearing the sound, breaking up the words. To the whole class.

RB: OK. So she just comes for five minutes. It feels like longer though. So does she come to deal with the pressure of Grade 1?

TM: Yes. In Grade 1. A lot of children. Struggle to read.

RB: Have you been introduced to Funda or Bella Wandé?

TM: Haven't heard of it? It's quite new and small in the Western Cape still. The only 150 schools doing it.

TA: I remember in the training Miss Africa mentioned that. We went for training with the R Maths before COVID.

RB: Do you feel like you could do with a bit of more training?

TM: No, we do get a lot of training. I'm not saying we need any more training. Even this year, we've had quite a few. We even had a power hour maths a power.

RB: What's a power hour?

TM: Adjust. Share nice ideas just to refresh you, just to bring you back because sometimes you forget. All the concepts what a child develops. Nice activity ideas.

RB: Is this the WCED?

TM: Yes.

RB: So do they come to the school?

TA: No, it's online. Find MS Teams.

RB: Ah, I see teams. But we are, slowly but surely.

RB: That's great news.

TM: Yes, I must say, and workshops are very focused on not forgetting how important the concrete active learning is. That leads up to the abstract. They definitely seems to be focus on Grade R. I think they're starting to realise it's more important and needs to be taken more seriously.

TA: Yes, I think there are and I think somehow we're being more, more recognised. Now that the department. Now that the Grade R teachers are beginning to be made permanent. Under the grade our teachers must now study and can't get away with. Not. Being fully qualified.

TM: Yes. It is all looking quite positive.

RB: And how are you finding your workloads? Marking assessments?

TM: Think the end of year is always hard. There's a lot of admin staff at the department wants, throughout the term it's OK, but at the end of the term, after the assessments they want to know assessment updates. They want to know training we've been doing. They also want to know what we've been doing. Planning. Assessments. We have examples. We hand in everything.

RB: Do they want them? No we sit with our HOD. And she goes through it all. Does she write a reports?

TM: Yes. She will go through it. And make changes. he will go through it.

RB: And now with the new changes, has there been no kickback? Is the HOD happy with the changes? Like she reports on those changes? Like she's happy that you're not following the rubric so strongly.

TM: Yes, she fully supports us.

RB: That's amazing.

TM: She fully supports the way we are assessing.

TA: Yes, even her advice when we are struggling, you can see it's much more informal.

RB: So now that you have had discussion about bringing everyday knowledge into teaching and learning ... how do you feel about the changes, do you sometimes find

yourselves looking at things differently? Do you find that those little changes perhaps have. Interrupt ...

TM: I know what miss means. Like the child might be able to do it more confidently than what they can put it down on paper. Oh, like for instance. The child who might be struggling hard to write but has very good memory. I have some of those whose handwriting might not all be there, but when it comes to memorising verbally. Then you can see so. So what I've personally learned. Is that each child is different. And you can't compare. There's no such as the child doesn't know anything. There is always something there, strong.

RB: Yes, that is what you were saying previously. Like the child is not be able to form the letter but can or write the number but does understand the number. But they have a good sense of number, like you say. Interrupts

TA: All they can do the jumbled jungle gym perfectly.

RB: So do you find that is more guiding you now? Like what the child can do versus? Interrupts.

TA: To be more open-minded. This is the way. The child can't do that, but the child can do this and this. Even to guide. Like I have the one child who's on my intervention list. Back overall, there's a bit of behaviour.

RB: Learning and behaviour are linked, aren't they?

TA: It's a bit of everything. So I know he loves playdough and he's been struggling with number So we now going on to #10. And he still busy, only knows up to #3, confidently counting out and knowing the number. So when I realised. Come and sit at the table with me and now he's more interested and now he knows up to #5. So he's not up to #10 where everyone else is at, but there is progress.

TM: With the language barrier. He really doesn't understand. It was a period with the uncle used to come, because I could explain to the uncle, then he would go and explain to the mummy. But it doesn't seem like he's in the picture anymore.

RB: That seems like a huge factor. The language factor.

TM: Yes. How can the mommy help? When she's not able to understand. And also now the mummy is working night shift. What language does he speak?

What language is Prince? I'm not sure. Are his parents migrant workers?

RB: Yes.

TM: Yes is the problem of the loss of culture. But they want to learn in English because otherwise they fear they're falling behind. Because. By Grade 4 they have to learn in English.

TM: I've also got a better understanding of teaching maths. I actually want to make a copy for the whole grade. My prescribed book. I've sold most of my books, but I won't sell that book. So I want to make copies of that book so we can sit. That book can help a lot.

RB: If you knew what you knew now. If you were starting to teach like a student in your class. What advice? Would you say you would give them in terms of how children learn and play? Like if you could each give. What advice, what pearls of wisdom would you give each of them?

TA: I would say the first thing to do is to get to know the child, the child, the children as individuals. Like, basically, don't judge a book by its cover. I firmly believe in that. I won't think like I wish he or she wouldn't do that. For example, a child does very well academically. She's going to do well all round. But that is not always the case. So I would say get to know the child as an individual. And then take it from there. When I say in the class individual, I say in the class off the class background. Definitely community. The child is a whole.

RBT: That's so interesting cause that's what this theory is all about. Not just operating in a vacuum.

TA: Yes, especially as based on the diversity of South Africa. We must know all our children. Even children can be judged. Things can be seen as a barrier. But it's not actually a barrier they have. When you get to know the child, then you can actually see. How do I say? It's just something that sticks to me. Like language is seen as a barrier. For example, there are different types of barriers. As the educator should not see that as the child is not

able to do it. You should just see that as taking how to help the child to improve. See it is work in progress.

TM: Like everyone learns every day. You shouldn't have expectations for child. Don't. Don't expect a child to jump over that hurdle. Like if you are teaching number one today, the child must know #1.

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