

# **Development of an emotion regulation serious game for educators**

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**Development of an emotion regulation serious game for educators**

by

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Submitted in partial fulfilment of the requirements for the degree

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## DECLARATION

I declare that the dissertation, which I hereby submit for the degree Magister Educationis at the University of Pretoria, 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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Danel van der Walt

18 April 2018

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## **ETHICAL STATEMENT**

The author, whose name appears on the title page of this thesis, has obtained for the research described in this work the applicable research ethics approval. The author declares that he/she has observed the ethical standards required in terms of the University of Pretoria's *Code of ethics for researchers and the Policy guidelines for responsible research*.

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# ABSTRACT

Development of an emotion regulation serious game for educators

by

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Degree: M-Ed

Educational demands necessitate an emotionally intelligent workforce, and evidence indicates that teachers' EI contributes to professional efficiency and learner outcomes. However, there is a paucity of EI teacher training interventions and research. This research is the first of two studies with the long term aim of developing and validating an intervention that potentially contributes to the need to foster teachers' Emotional Intelligence (EI) from an adult learning perspective. In this study, I conceptually developed an Emotion Regulation (ER) serious game by applying a pragmatic Developmental Research (DR) approach. This is favoured for generating theoretical and practical solutions to complex educational problems. Through iterative cycles of reviews, analysis, design and evaluations, I generated two sets of heuristics.

I firstly generated procedural heuristics, which provided procedural activities to develop my envisaged intervention. Guided by my DR procedural framework, I researched theoretical and practical sources of information to conceptually design my first ER serious game prototype. These involved reviews of (1) Adult Learning Theory (ALT); (2) EI from a psychological perspective, narrowed down to (3) The theory of ER; and (4) Serious game design strategies. These also involved an analysis of (5) The particular contextualised ER needs of the end user. From these sources, I secondly generated an evolving set of substantive heuristics, which provided the essential design characteristics of the intervention itself. I reflected on and formatively evaluated the evolving procedural and substantive heuristics generated. I furthermore provided recommendations for future research on the basis of the constraints experienced in this study.

**Key words:** Developmental Research; Design components; Heuristics (substantive and procedural); Adult Learning Theory; Emotional Intelligence; Emotional Regulation; Serious game design

## EDITING CERTIFICATE

### *Exclamation Translations*

To whom it may concern

The dissertation titled, "Development of an emotion regulation serious game for educators" has been edited and proofread as of 23 April 2018.

As a language practitioner, I have a Basic degree in Languages, an Honours degree in French and a Master's degree in Assessment and Quality Assurance. I have been translating, editing, proofreading and technically formatting documents for the past seven years. Furthermore, I am a member of the South African Translators' Institute (SATI) and the Professional Editors' Guild (PEG).

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Kind regards



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## **LIST OF ABBREVIATIONS**

ALT:	Adult Learning Theory
ANC:	African National Congress
DR:	Developmental Research
EI:	Emotional Intelligence
ER:	Emotion Regulation

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# **CHAPTER 1 INTRODUCTION TO THE STUDY**

As a teacher I must just be honest with you, and it's not only me, it's almost everybody ... my colleagues and everybody. Come Sunday, we are very, very, very angry because teaching is not what it used to be, it is very, very stressful. Sunday afternoon we become very, very angry. Look, today it is only Wednesday and we are in the third or fourth week since opening, but we are dead tired. It's not only me because I am old, even younger teachers. I am very tired, I don't sleep during the day, but now in the past week I've been sleeping. (Interview with an educator)

## **1.1 INTRODUCTION**

Teachers in South African schools seem to relate to the above sentiment, which shows the emotional demands faced within the teaching profession. The above sentiment also shows the emotionally-orientated reactions of teachers when they seek to regulate the plethora of emotions that they experience. It is widely accepted that an emotionally intelligent person can better deal with above-average emotional demands (Joseph & Newman, 2010; Sanchez-Ruiz et al., 2013). As such, professionally developing the Emotional Intelligence (EI) of teachers would seem to be an effective solution for the creation of an emotionally intelligent workforce. Professionally developing the EI of teachers has, however, remained a complex educational challenge for both researchers and practitioners. This study, which is the first of a two-part research project, aims to contribute to an effective solution to this complex challenge. To understand the above-average emotional demands experienced by teachers, and the intricacies of solving the need for an emotionally intelligent workforce, some historical background on the complex South African educational system is required.

## **1.2 BACKGROUND**

The history of education in South Africa is complex as changes in the South African educational system have coincided with broader societal changes. The greatest influence on the educational system occurred in the period between 1880–1940, coinciding with the discovery of minerals, and subsequent rural-urban migration. These societal changes brought about a need for the provision of skilled workers, as well as efforts to control unskilled workers for the provision of cheap labour. This impacted South Africa economically, politically and socially; and shaped today's educational system (Christie, 1991). Gradually, inequalities were brought into every sphere of society, including educational policy. One such example is the formation of new social classes along racial lines. While unskilled workers providing cheap labour were politically



controlled by pass laws and the migrant labour system, a demand for skilled labourers meant the prioritising of large-scale schooling. After the Anglo-Boer War (1902), the ruling British government provided free and compulsory schooling for White children. In contrast, Black education was neither free nor compulsory, and mainly characterised by missionary schools. Apart from the racial division, cultural opposition against 'English schooling' came from defeated White Afrikaners. This opposition resulted in the formation of Christian National Education schools, which were also not free or compulsory. Under British control, and thereafter under the Nationalist government, Black education remained neglected, facing severe shortages of schools, money, and teachers. In turn, few Black learners received schooling (Christie, 1991).

During the 1940s, manufacturing industries became an additional driving force of social change. Job possibilities meant even greater rural-urban migration, while heavily enforced segregation under the ruling Apartheid system meant a time of political organisation and strike action until 1960. During this time, educational policy decisions reflected radical measures to control Black education through the Bantu Education Act. Schools for Black learners had to register with the government, and as a result almost all mission schools closed down. Different educational systems for Whites and Blacks further entrenched educational inequality along racial and class lines. Although more Black learners attended school after the Bantu Education Act, less than 1% attended Grade 12 until the 1970s (Christie, 1991).

During the 1970s, educational policy was once again impacted by social resistance and opposition in the form of the Soweto uprisings in June 1976. Although education remained unequal and segregated, educational policy decisions started to change. More funds were made available for Black education, teacher training and the building of schools. In 1980 the government set up the De Lange Commission to conduct an in-depth investigation into education. The De Lange Report recommended a changed school structure, a single department of education, and education of equal quality for all. Although it took another ten years for multi-cultural schools to be institutionalised, a new era of political reform under the presidency of F.W. de Klerk was under way, resulting in the unbanning of the African National Congress (ANC) (Christie, 1991).

In 1994, under the ANC-led government, policy formation for a democratic education system became entangled in controversy and confusion. Apart from the newly elected government's endless transitional priorities, blueprint designs for educational policy frameworks were created from international and local practice. This responsibility was given to the national Department of Education, while the nine provincial Departments were responsible for its implementation. From the start, the weaknesses of these frameworks became evident. It lacked

the strategies and available capacity for effective implementation at ground-level (Christie, 2006; Ornstein & Hunkins, 2014). Unprepared teachers were left with the major challenge of implementing a sophisticated system (Carl, 2012, p. 21) promoting equality, while profound inequalities remained (Christie, 2006). One such inequality, which remains to this day, is the great disparity between rural and urban schools, whereas most rural and township schools still lack quality education. Poor rural learners often do not receive formal education as they carry the burden of running entire households (Ornstein & Hunkins, 2014). While it was expected of teachers to ensure quality education for all, teachers were subjected to a watered down 'cascade' model of training the trainer, resulting in gross misinterpretation and confusion at ground-level (Carl, 2012; Ono & Ferreira, 2010). Teachers were consequently left unempowered to deal with the major challenges thrust upon them. Some of these challenges relating to socio-political and policy changes include:

- Work overload (Burger, 2009; Johnson & Naidoo, 2017).
- Administrative load (Johnson & Naidoo, 2017).
- A lack of sufficient resources (Burger, 2009; Shaughnessy et al., 2013).
- Overcrowded classes (Burger, 2009; Johnson & Naidoo, 2017; Shaughnessy et al., 2013).
- A lack of departmental support (Burger, 2009; Johnson & Naidoo, 2017).
- Emphasis on performance as an indicator of quality (Burger, 2009).
- Dealing with diversity in the classroom (Burger, 2009; Lubbe, 2012).
- The requirements of taking on a parental and pastoral care role regarding learners' needs (Burger, 2009).
- A lack of career opportunities and development (Burger, 2009).

Coupled with contextual realities such as poverty, violence, and the implications of HIV and AIDS, emotional burnout amongst South African teachers seems prevalent (Johnson & Naidoo, 2017; Le Mottee & Kelly, 2017).

Furthermore, concurrent with local demands, it is expected from teachers to respond to the rate of broader societal changes as a result of technology and globalisation. According to Greenhill (2010), today's teachers need 21<sup>st</sup> century knowledge and skills such as technology-enhanced assessments, face-to-face and virtual knowledge sharing amongst teacher communities, and learning in relevant and real-world contexts. Specifically on an emotional level, Dolev and Lesham (2017), and Jennings and Greenberg (2009) stress the global expectation that today's teachers need to:

- Create a warm and nurturing learning climate.
- Be emotionally responsive to learners.

- Effectively and respectfully deal with disruptive learners' challenging behaviour.
- Model competent emotion regulation.

According to local (Maree & Mokhuane, 2007) and global scholars (Bichelmeyer et al., 2010), these demands necessitate an emotionally intelligent workforce. Consolidating frequently cited definitions, EI can be described as human abilities, traits or competencies related to one's emotional capacity to deal with and reflect on one's own emotions and the emotions of others (Bar-On, 2012; Boyatzis, 2009; Mayer et al., 2004; Petrides, 2010). An emotionally intelligent teacher can therefore be viewed as having the emotional capacity to deal with and reflect on their emotions and the emotions of others, resulting in effective emotional thinking processes and problem-solving behaviour.

EI training interventions as part of teachers' professional development might address the need for emotionally intelligent teachers locally (Lubala, 2017; Shaughnessy et al., 2013) and globally (Brackett et al., 2009; Dolev & Lesham, 2007). Training entails the act of coaching or accustoming a learner to a mode of behaviour or performance problem (The American Heritage Dictionary of the English Language, 2018). As such, an EI training intervention refers to an "act or process of intervening" by means of a "systematic process of assessment and planning employed to remediate or prevent" a particular problem (The American Heritage Dictionary of the English Language, 2018) regarding the educational problem of fostering teachers' EI.

### **1.3 PROBLEM STATEMENT**

There are, of course, global 21<sup>st</sup> century demands (Greenhill, 2010) and emotional expectations (Jennings & Greenberg, 2009; Dolev & Lesham, 2017) that teachers must meet. In relation to these, the particular local contextual realities and socio-political challenges (e.g., Johnson & Naidoo, 2017) in South African schools render teaching an intensely emotional activity (Palmer & De Waal, 2011). In this regard, prominent contributors to the field of EI (Brackett et al., 2010; Joseph & Newman, 2010) indicate that teachers with a high EI tend to employ more appropriate strategies to deal with different work stressors.

Researchers, including Jennings and Greenberg (2009), have established through empirical studies that EI-competent teachers are more likely to develop and foster supportive teacher-learner relationships. These are characterised by their ability to understand and respond to learners' emotional needs. EI-competent teachers are equally more likely to demonstrate effective classroom management based on their ability to understand classroom conflict situations, guide learner behaviour and promote enthusiasm and enjoyment of learning (Jennings & Greenberg, 2009).

In addition, teachers who have a high EI seem to transfer EI competency to learners through modelling (Jennings & Greenberg, 2009; Zeidner et al., 2002). Consequently, a healthy classroom climate is created. In turn, this seems to contribute to learners' social, emotional and academic outcomes. It furthermore advances teachers' commitment (Jennings & Greenberg, 2009), their professional and personal efficiency (Perry & Ball, 2007) and job satisfaction (Brackett et al., 2010; Joseph & Newman, 2010). In contrast, classroom climates established by teachers who are EI *incompetent* seem to be marked by taxing learner behaviour and work experiences that lead to increased negative emotions, which reduce teachers' intrinsic motivation and feelings of self-efficacy (Jennings & Greenberg, 2009). As such, EI incompetent teachers are more likely to become emotionally burned-out, resulting in them either leaving the profession (Brackett et al., 2010; Jennings & Greenberg 2009; Joseph & Newman, 2010) or enforcing a hostile and rigid learning environment (Jennings & Greenberg, 2009). Apart from potentially harming learners psychologically, such hostile environments might potentially lower learners' academic performance (Jennings & Greenberg, 2009).

In South Africa, the rate of teachers experiencing a lack of job satisfaction or emotional burnout and subsequently leaving the profession is indicative of a workforce that is unable to cope with the emotional and educational demands (Le Mottee & Kelly, 2017; Lubbe, 2012). Therefore, acknowledging the significance of South African teachers' EI as part of their professional development is imperative for an effective EI workforce (Brackett et al., 2013; Palmer & De Waal, 2011; Schutte et al., 2013).

The professional development of teachers is currently dependent on the opportunities provided by the Department of Education's (DoE) *continues professional teacher development management system* launched in 2014 (Mpisi, 2017). Within this system, development opportunities focus primarily on cognitive subject training rather than emotional and relational practice (Lubala, 2017; Mpisi, 2017). Globally and locally, the significance of emotions in teachers' work life seems to be ignored or downplayed in policy decisions (O'Connor, as cited in Fried, 2011). Currently, the DOE educational action plan towards 2025 (DBE, 2011) for the most part "ignore[s] or underplay[s]" the emotional dimension of teachers' work (Palmer & De Waal, 2011, p. 171). Expecting teachers to address their own emotional needs without appropriate support seems equally futile. Teachers themselves report a lack of motivation, time and tools to deal with life-skill issues themselves (Maree & Mokhuane, 2007; Lubbe, 2012; Zeidner et al., 2002). Due to teachers' contextual position in their professional and personal lives (Merriam & Bierema, 2014), teachers as adult learners have learning needs that are different from those of children (Knowles, 1980). As such, ignoring the emotional practices of teachers confirms a lack

of consideration for the adult nature of the workforce. This emphasises a need for structured and well-supported EI interventions for teachers (Brackett et al., 2009) as adult learners.

While evidence of teachers' EI contributing to professional efficiency and learner outcomes has been established, it is concerning that training interventions explicitly aimed at teachers' EI development are still scarce (Dolev & Lesham, 2017; Jennings & Greenberg, 2009). Research focusing on investigating EI training interventions for teachers seems to be equally lacking (Dolev & Lesham, 2017). Reinforcing these concerns is a seeming paucity of documented theoretical underpinnings of existing EI interventions (Thory, 2013). For these reasons, it seemed important to address this need, and to base it on sound Adult Learning Theory (ALT). Existing literature in the field of EI interventions is furthermore conflicting and mixed as research (e.g. Austin, 2010; Petrides & Furnham, 2001) illuminates delimiting factors deterring the use of existing EI interventions. These limitations relate to conflicting theories, as well to existing measurement and scoring methods (Cherniss, 2010a).

Given the need for an EI workforce in South Africa and the current scarcity of efficient EI interventions grounded in sound ALT, still not enough is known about the most appropriate intervention characteristics that will contribute to teachers' EI competency as adult learners. I therefore decided to conceptually develop a context-bound EI intervention that is grounded in ALT and that might contribute to the field of EI by potentially addressing some of the EI limitations reviewed. The envisaged intervention took on the form of a serious game. This was in line with particular instructional ALT and alleviating EI suggestions, which promote the application of problem-based learning strategies, simulations or games.

#### **1.4 CONCEPTUAL UNDERPINNINGS OF THIS STUDY**

Effectively contributing to the fostering of emotionally intelligent teachers within the complex South African educational system seems to necessitate solutions from both theory- and practical-orientated research (Schutte et al., 2013). I aimed to develop one such potential solution through the application of Developmental Research (DR) that combines research and development. In particular, I aimed to develop a suitable and contextualised EI intervention for teachers in the form of an Emotion Regulation (ER) serious game.

DR refers the processes involved in the systematic analysis, design and evaluation of an educational intervention for the purpose of generating research-based products that serve as solutions to complex, context-specific educational problems (Plomp, 2013). DR is synonymous with Design-Based-Research (Reeves, 2000). The application of a DR approach typically allows for theory- and practice-based decision making with regard to the two sets of heuristics or 'how

to' guidelines of the proposed solution (Plomp, 2013). The use of these two sets of heuristics entailed:

- Procedural heuristics that provided the procedures or prescriptive 'how to' of developing such a solution (Alghamdi & Li, 2013; Plomp, 2013; Wang & Hannafin, 2005). This meant selecting and applying the most promising set of development activities, thus ensuring a contextualised and workable intervention (Alghamdi & Li, 2013; Plomp, 2013; Wang & Hannafin, 2005).
- Substantive heuristics that provided the characteristics or prescriptive 'how to' of the solution itself (Edelson, 2006; Plomp, 2013; Wang & Hannafin, 2005). This meant selecting and applying the most appropriate information about essential design characteristics to ensure a potentially effective intervention (Edelson, 2006; Plomp, 2013; Wang & Hannafin, 2005). I present my substantive heuristics as a sequence of practical activities to be conducted before and during the envisaged intervention.

Heuristics are also known as domain theories, local (intervention) theories, design principles, theoretical yields or lessons learned (McKenney et al., 2006; Plomp, 2013; Van den Akker, 2013).

My heuristics were informed by theoretical and practical sources of information. A review of DR literature, as well as its practical implications for an effective intervention (e.g. Plomp, 2013) informed the procedural heuristics of how to develop the ER serious game for teachers. I adapted the generic DR processes to serve as a personalised procedural conceptual framework (see Figures 2.3 and 2.5, Chapter 2) to generate a set of evolving substantive heuristics of the solution itself.

My conceptual framework for this study is embedded in five sources of information that informed the substantive heuristics. These sources involved: (1) Adult Learning Theory's (ALT) instructional suggestions; (2) EI from a psychological perspective, narrowed down to (3) The theory of ER; (4) The particular contextualised ER needs of the end user; and finally, (5) Serious game design strategies.

I firstly reviewed ALT (e.g. Knowles, 1990) to gain theoretical and practical insights into instructional suggestions that might increase the effectiveness of an intervention aimed at teachers, and on which to base all subsequent reviews and analyses. I secondly reviewed the EI literature comprising EI theory and EI measurement and scoring practices (e.g. MacCann & Roberts, 2008) that I found relevant to the ALT suggestions. From the EI literature, I illuminated existing EI practices' delimiting factors, as well as EI contributors' (e.g. MacCann, 2006) suggestions to alleviate and combat the existing limitations. EI suggestions prompted a

conjectural decision to focus on ER as a common facet of EI. As such, I thirdly reviewed the ER literature comprising ER Theory and existing ER research geared towards teachers (e.g. Gross, 1998a; Sutton, 2004). I used the first three literature reviews to formulate a set of conjectural substantive heuristics (see Figure 3.7, Chapter 3) to be embedded in the design components of my envisaged intervention. Design components refer to my envisaged intervention's rationale, goals and objectives, content, learning strategies, assessment and evaluation strategies, and format.

Two all-encompassing conjectural decisions involved (1) The employment of teachers' own ER experiences as learning opportunities, and (2) The integration of the intervention into teachers' real life through the application of a serious game for training, measurement and scoring purposes. These all-encompassing conjectural decisions prompted the fourth and fifth sources of information, which in turn refined the conjectural substantive heuristics. I fourthly conducted an analysis of the end user's practice, which informed me about contextualised ER needs. I obtained information about teachers' expressed ER experiences and practices by conducting two rounds of semi-structured interviews with in-service teachers. I fifthly reviewed the literature on serious game design strategies. This provided theoretical and practical application value to my conjectural decisions.

From the refined substantive heuristics, I was able to conceptualise the first prototype of an ER serious game for teachers. I subsequently realised the dual aim and purpose of this study.

## **1.5 PURPOSE OF THIS STUDY**

The purpose of this study was to answer the primary research question:

**How can one conceptualise a contextualised ER intervention in the form of a serious game that aims to foster in-service teachers' EI from an adult learning perspective?**

I responded to this question by answering the following secondary research questions:

1. How can the application of DR be used to conceptually develop a contextualised ER serious game?
2. What is the nature of existing EI intervention constraints and how can they be alleviated within an adult learning environment?
3. What are the ER needs of in-service teachers and how can these inform the conceptualisation of a contextualised intervention for teachers?
4. How can serious game design strategies provide applicational value to the conceptualisation of a contextualised intervention for teachers?

5. How can the application of DR increase the quality of the conceptualised ER serious game characteristics and development processes followed?

I initiated this study as the first of a two-part research project. This study provides a conceptualisation of the first prototype design and the procedural and substantive heuristics for an ER serious game that might contribute to fostering teachers' EI. The second future study will focus on the finalisation of the current prototype design, as well as the implementation and validation thereof in practice. By structuring the research project into distinct research studies, I adopt Phillips' (2006, p. 147) argument that an undesirable amount of emphasis is placed on the testing or validation of design outcomes, while "factual and theoretical background knowledge" embedded in the earlier phases ensures the quality of the outcome.

## **1.6 LIMITATIONS, ASSUMPTIONS AND DESIGN CONTROLS**

This study was subjected to particular limitations, which I attempted to control, as well as particular assumptions governing my research and design decisions. Through the quality-orientated reflections and evaluations that I conducted in this study, I highlighted threats to the study's quality that I attempted to mitigate. This included highlighting particular limitations that I found to be (1) Mitigatable only within a future study or within my second future study or (2) Unnecessary to mitigate or having no significant impact on the research process or yields of this study. I describe these threats and limitations in Chapter 2, and in detail in my Field Notes (Appendix P).

An example of one such highlighted limitation that I found to be mitigatable only by a second future study entails that my substantive heuristics generated from the ALT, EI, ER and serious game literature might become outdated and irrelevant before I commence with the second future study. This means that I have to revisit my information sources during the second future study to account for the lengthy and iterative nature of my DR process. An example of a highlighted limitation that I found as having no significant impact on the research entails that one participating teacher from my sample left the teaching profession and therefore discontinued participation. On the basis that the teacher discontinued only after the first interview, and that the second interviews' data collected saturated pre-figured categories from ER Theory, I regarded this occurrence as having no significant impact on my inquiry's derivative.

Two assumptions governed my research and design decisions. With regard to my research decisions, I initiated this research on the assumption that teachers' EI influences their professional effectiveness, and in turn the learning outcomes of learners. I furthermore



assumed that the most favourable research solution was to expose in-service teachers to a suitable and effective authentic, activity-based EI intervention. I assumed that in-service teachers are currently experiencing a critical need that must be addressed. In terms of my design decisions, I specifically embarked on a DR study on the assumption that DR provides the most suitable processes to achieve the most effective research and design outputs, and subsequently the most significant contribution to (1) The problem of fostering teachers' EI, and (2) The field of educational development. In order to appreciate the DR processes and products at issue in this study, some key concepts need clarification to contextualise this study appropriately.

## **1.7 KEY CONCEPTS**

I herewith provide a description of the three key concepts incorporated in the research topic.

### **1.7.1 Development**

In this study, development refers to the process that I followed to produce an ER serious game for teachers. This was reliant on DR as my overarching development approach. DR is the systematic analysis, design and evaluation of an educational intervention for the purpose of generating research-based solutions to complex, context-specific educational problems (Plomp, 2013). DR is synonymous with design-based research (Reeves, 2000).

### **1.7.2 Emotion Regulation (ER)**

ER is one of the common facets found in dominant models and measures of EI (Kotzé & Venter, 2011). ER can be described as “the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions” (Gross, 1998b, p. 275; 2014, p. 20). In the context of this study, I relied on the adapted ER process derived from Gross's (1998a, 1998b) ER Theory, which practically represents (a) Particular emotion-triggering situations, (b) The potential activation of particular emotion regulatory goals, (c) The employment of one or more ER strategies, and (d) The possibility of these leading to particular outcomes based on the appropriateness of the strategy(ies) selected.

### **1.7.3 Serious game**

Michael and Chen (2006, p. 17) define a serious game as “a game in which education [...] is the primary goal, rather than entertainment.” Arnab et al. (2014) explain that serious games should essentially be ‘serious’ and ‘games’. This means that the game should establish transfer of learning whilst also remaining entertaining and engaging. In essence, serious games provide an

all-encompassing scope depicting a digital and/or analogue application for learning focused on education or additional applications such as therapy, art or advertising (Breuer & Bente, 2010).

In the context of my study, I refer to a serious game as a digital or analogue learning game that is used for the purpose of increasing teachers' ER in order to contribute to their EI.

## **1.8 SUMMARY**

This study is aligned with the secondary research questions and the study's heuristical yields. Answering the secondary research questions by means of generating theory and practice-based procedural and substantive heuristics meant that I addressed the dual aim of this study. I was firstly able to conceptualise a contextualised educational intervention; and secondly contribute to knowledge on the educational problem of fostering teachers' EI, as well as to the field of educational development.

In Chapter 2, I answer the first secondary research question by means of introducing the procedural heuristics generated from the DR literature. This entails a description of the DR approach, as well as a conceptual visualisation (see Figures 2.3 and 2.5, Chapter 2) and a description of the DR phases, cycles and methodological research activities followed to develop my envisaged intervention.

In Chapter 3, I answer the second secondary research question by means of introducing the conjectural substantive heuristics generated from the ALT, EI and ER literature (Figure 3.7, Chapter 3). This entails instructional ALT suggestions, and my conjectural decisions from reviewing EI contributors' suggestions to alleviate existing EI theory, measurement and scoring limitations.

In Chapter 4, I answer the third and fourth secondary research questions by means of introducing the refined substantive heuristics generated from a qualitative analysis of in-service teachers' contextualised ER needs, and an exploration of serious game design literature (Figure 4.5, Chapter 4). This entails a description of the analysis' derivatives, as well as a description of serious game design strategies that might actualise the conjectural substantive heuristics. The analysis' derivatives refer to the content that I derived from the analysis of the teachers' contextualised ER needs. I conclude this chapter by presenting the conceptualisation of the first prototype design for an ER serious game for teachers.

In Chapter 2-4, I further integratively answer the fifth secondary research question. I describe how I applied a set of quality criteria derived from the DR literature to the procedural and

substantive heuristics generated (see Figure 2.4, Chapter 2). This includes a description of the quality reflections, as well as the formative evaluations that I conducted by means of researcher screenings (Appendix A-D). I furthermore describe the potential threats that I identified, and the mitigated actions that I implemented where possible to modify and improve the evolving heuristics in detail in my Field Notes (Appendix P).

In Chapter 5, I conclude this study by providing summarised descriptions of my procedural and substantive heuristics, as well as how I attempted to answer the secondary questions posed. I end this chapter by providing a summarised description of the implications of this study and my recommendations for the second future study that I intend to conduct as well as future studies conducted by other researchers.

# CHAPTER 2 DEVELOPMENT RESEARCH PROCESS

## 2.1 INTRODUCTION

The purpose of this study was to conceptualise an educational intervention that fosters in-service teachers' ability to regulate their emotions, as viewed from an Emotional Intelligence (EI) theoretical framework. An educational intervention can be described as an "act or process of intervening" by means of a "systematic process of assessment and planning employed to remediate or prevent" an educational problem (The American Heritage Dictionary of the English Language, 2018). An educational intervention could, for example, be a programme, a teaching-learning strategy or materials, or products and systems (Plomp, 2013). In this study, the intervention was a product, namely, a hybrid serious game in its conceptualised form.

In practice, such interventions are characteristically hampered by a lack of coherence between what the developer intended and what is actually being realised (Plomp, 2013; Van den Akker, 2013). The lack of coherence manifests in various ways. Parsons and Beauchamp (2012) and Van den Akker (2013) characterise it as:

- The intended, comprising the underlying vision or basic philosophy and the specified written intentions.
- The implemented, comprising the end users' interpretation and the operationalisation or enactment in the setting.
- The attained or realised, comprising the end users' experiences from their perspective and the outcomes achieved.

It has become a high priority for both educational developers and researchers to find a way to solve the discrepancy between intended, implemented, and attained interventions. This means matching what is intended by the developer or researcher to what is actually experienced or learned by the end users, therefore ensuring the realisation of the intervention's intended rationale. This study focused on the development of my intended intervention, which could practically and effectively contribute to teachers' EI, and could develop the theoretical field of EI and educational development. Combining the fields of development and research allows for research-based solutions to complex, context-specific problems in collaboration with the end-user (Plomp, 2013), which might potentially ensure a close relationship between the intended and attained.

## 2.2 THEORETICAL FOUNDATIONS

In order to ensure a close relationship between my intention and what might be implemented and eventually attained, I decided to apply the combined educational approach of Developmental Research (DR) (e.g. Nieveen & Folmer, 2013; Plomp, 2013; Thijs & Van den Akker, 2009). This was intended to serve both theory and the practice of designing a hybrid serious game that encompasses digital technology in combination with analogue methods as an educational tool for developing teachers' EI.

From the history of DR, I learned that it is widely accepted that DR had its origin in the work of Brown (1992), who describes classroom design experiments. Collins (1992), who describes developmental research for the integration of technology in classrooms (Herrington et al., 2007), also significantly added to this field. Brown (1992) and Collins (1992) agree that DR is a rigorous and reflective inquiry to address complex problems with plausible solutions in real contexts involving collaboration with practitioners. In practice, such inquiry tests and refines innovative learning environments, as well as generating reusable heuristics (Herrington et al., 2007). DR can be defined as the systematic analysis, design and evaluation of an educational intervention for the purpose of generating research-based solutions to complex, context-specific educational problems (Plomp, 2013). A key distinguishable feature of DR is its dual purpose. The first purpose is to generate innovative research-based solutions to complex problems for development purposes. The second purpose is to establish heuristics for scientific research purposes (Clements, 2007; Van den Akker, 2013). DR provides usable knowledge (Plomp, 2013) to be applied in practice. As such, the developmental advantage of DR is that it strengthens traditional educational research's weak link with practice (see Section 2.3) (Van den Akker, 2013). In turn, the research advantage of DR is that it provides theory building from the development of heuristics, which addresses the seeming lack of reliable scientific knowledge creation within the educational community (Anderson & Shattuck, 2012; Clements, 2007; Plomp, 2013).

Therefore, rather than applying traditional educational development approaches (see Section 2.4) to develop my intended intervention, I decided to use a DR approach for this development research project. This means that I focused on the research elements, interrogating theory, existing EI literature and the current EI education needs of in-service teachers. My aim was to generate theory and practice-based heuristics that might guide the development of a contextualised educational intervention. I furthermore aimed to use such heuristics to attempt to contribute to the knowledge base on the educational problem of fostering teachers' EI, as well as to the field of educational development. In practice, I was able to materialise the research

aim in addressing the problem of fostering teachers' EI through the development of an innovative intervention.

## **2.3 IN PRACTICE**

In order to develop an innovative intervention in practice, I conducted an intensive and systematic initial review and analysis. I used state-of-the-art information from the literature to guide this process. I also used collaborative information from the context of in-service teachers' current EI abilities as experienced in the workplace. Both of these methods were suggested by Van der Akker (2013).

I researched theoretical and practical sources of information during my initial review and analysis in Phase 1 (Figure 2.3) of this study. These sources involved (1) ALT's instructional suggestions; (2) EI from a psychological perspective, narrowed down to (3) The Theory of ER; (4) The particular contextualised ER needs of the end user; and finally (5) Serious game design strategies.

I firstly reviewed the ALT (e.g. Knowles, 1975, 1980, 1990; Merriam & Bierema, 2014), which provided me with instructional suggestions for an effective adult learning intervention on which to base subsequent reviews and analysis.

I secondly reviewed the EI literature, which comprised EI theory, as well as existing EI measurement and scoring practices (Bar-On, 2010; Boyatzis, 2009; MacCann & Roberts, 2008) that I found relevant to the ALT suggestions. From the EI literature, I illuminated existing EI practices' delimiting factors, as well as EI contributors' suggestions to combat the existing limitations (Austin & Saklofske, 2010; Brackett, 2014; MacCann, 2006; Shaughnessy et al., 2013).

EI suggestions made by acknowledged researchers prompted me to focus on ER as a common facet of EI. As such, I thirdly reviewed the ER literature, which comprised ER theory (see Gross, 1998a, 1998b, 2014, 2015), as well as existing ER research geared towards teachers (Gong et al., 2013; Sutton, 2004).

I used the instructional suggestions derived from ALT, the alleviating EI suggestions, and ER theory and research to formulate my conjectures. In this way, I attempted to define clear and appropriate conjectural heuristics (see Figure 3.7, Chapter 3) to be embedded in the design components of my envisaged intervention. Two all-encompassing conjectural decisions involved (1) The employment of teachers' own ER experiences as learning opportunities, and (2) The integration of the intervention into teachers' real-life through the application of a serious game for training, measurement and scoring purposes. These conjectural decisions from

ALT, EI and ER literature prompted the fourth and fifth theoretical and practical sources of information.

I fourthly conducted an analysis of the end users' practice, which informed me about contextualised ER needs. I gathered information about teachers' expressed ER experiences and practices by conducting semi-structured interviews with in-service teachers. This method provided me with the authentic, context-bound ER situations, goals and strategies experienced and employed by the participating teachers. I fifthly explored the literature on serious game design strategies, which provided theoretical and practical applicational value to my conjectural decisions. The findings of these reviews, analyses and explanations served as the basis of my conceptualised intervention.

From the analysed field interviews, and existing serious game design literature, I was able to conceptualise my first prototype of an ER serious game for teachers in Phase 2 (Figure 2.3). As such, I subsequently realised the dual aim of this study. By generating theory and practice-based heuristics, I was firstly able to develop a contextualised educational intervention; and secondly contribute to the knowledge base on the educational problem of fostering teachers' EI, as well as to the field of educational development.

Guided by van den Akker (as cited in Plomp, 2013, p. 24), I generated and refined two sets of heuristics distinguishing between my intended intervention's characteristics and the development process. Through continuous reflection and documentation (McKenney et al., 2006; Plomp, 2013; Van den Akker, 2013), I derived a set of *substantive* and *procedural* heuristics. Substantive heuristics provided the characteristics, or the prescriptive 'how to' solution of the intervention itself. This means that I had to select and apply the most appropriate information about essential design characteristics to ensure a potentially effective intervention (Edelson, 2006; Plomp, 2013; Wang & Hannafin, 2005). Procedural heuristics provided the procedures, or the prescriptive 'how to' solution for developing such an intervention. I had to thus select and apply the most promising set of development activities, ensuring a contextualised and workable intervention (Alghamdi & Li, 2013; Plomp, 2013; Wang & Hannafin, 2005).

I finally conducted transparent, quality-orientated reflections and formative evaluations of my evolving heuristics, which formed the basis of the adaptations and improvements made (Thijs & Van den Akker, 2009). I focused on the quality criteria of (1) Relevance, fairness and comprehensiveness, (2) Consistency, (3) Expected practicality, and (4) Expected effectiveness of my evolving intervention (Van den Akker, 2013). As a benchmark for producing formative findings, transparency refers to "the need to be explicit, clear and open about the assumptions

made and the methods and procedures used” (Hiles, 2007, p. 2). By producing transparent reflections and evaluations, I attempted to lessen the seeming lack of transparency characterised by complex research processes involving many interpretations and iterations (Akkerman et al., 2008). I furthermore attempted to increase the context-bound (Plomp, 2013) replicability of the process (Bakker & Van Eerde, 2015) to similar settings or with a different common EI facet.

DR’s theoretical foundations and the practical implementations thereof can be embedded in models representing interacting parts (Parsons & Beauchamp, 2012). Before I describe the interacting parts of the available DR models, I first provide an overview of the traditional educational development approaches preceding the DR approach (Gravemeijer & Cobb, 2006; Plomp, 2013) and the associated models.

## **2.4 APPROACHES TO CURRICULUM AND INTERVENTION DEVELOPMENT**

Approaches to development, including the development of educational interventions, traditionally underpin curriculum development, curriculum design and instructional design (Gravemeijer & Cobb, 2006; Plomp, 2013; Van den Akker, 2013). Effective curriculum and intervention development processes are therefore typically guided by a particular approach stemming from a particular philosophy, e.g. modernism or post-modernism (Ornstein & Hunkins, 2014). In turn, approaches are embedded in models that represent the phases and components of the process and sub-processes, and their interrelationships. As such, an approach guides the methods selected and used to conduct the development process, encompassing the particular design process components within the design.

Approaches can be divided in two types, primarily characterised by their underlying philosophy and focus. From a philosophical perspective, Ornstein and Hunkins (2014) distinguish between technical/scientific and non-technical/non-scientific approaches, as summarised in Table 2.1. The models used to represent a particular development process are closely linked to these two types of approaches and their distinct characteristics. Technical/scientific approaches typically connect with product-based models, which favour linear and logic representations. These also emphasise the predictability and effectivity of development and the final fixed end products of learning. In contrast, non-technical/non-scientific approaches connect with process-based models. Such models typically represent the subjective and unpredictable nature of constructive and activity-focused development processes, as summarised in Table 2.1.



Table 2.1: Types of approaches and their distinguishing characteristics (Carl, 2012; O’Neill, 2010; Ornstein & Hunkins, 2014; Parsons & Beauchamp, 2012; Thijs & Van den Akker, 2009)

<b>Distinction</b>	<b>Technical/Scientific</b>	<b>Non-technical/non-scientific</b>
Nature	Objective	Subjective
Procedures	Logical, predictable, effective	Experimental, contextualised, constructive
Focus	Product	Activity-based processes
Nature of product	Fixed, predictable	Fluid, emergent, unpredictable
Role of learners	Passive	Active
Models	Product-based	Process-based

From the characterisation summarised in Table 2.1, it is evident that these two types of approaches represent two extreme viewpoints of the curriculum approach. However, on their own, each approach seems restricting. Therefore, I decided to approach my envisaged intervention’s development process from a pragmatic perspective (McKenney et al., 2006; Plomp, 2013; Van den Akker, 2013). Pragmatism is an approach that does not adhere to either of the two extreme viewpoints, but rather applies characteristics from both approaches that are fit for the purpose of the task at hand (Carl, 2012; Ornstein & Hunkins, 2014).

The DR approach and the DR model that I applied in this study are essentially underpinned by a pragmatic approach. Cohen et al. (2011, p. 23) describe a pragmatic approach as practical, pluralistic and “methodologically eclectic” with the intention of finding solutions to practical problems in the real world. This means that the DR model that I utilised is based on a methodological ‘best fit’ approach (Nieuwenhuis, 2007a). This is particularly concerned with the progressive nature of the research (Carl, 2012; Schuh & Barab, 2008) and with finding solutions to practical problems in the real world (Cohen et al., 2011). This approach allowed me to select elements and characteristics of two seemingly opposing approaches, namely, a technical/scientific approach and a non-technical/non-scientific approach (Table 2.1). The development and design processes related to this approach will be discussed further on.

## **2.5 DR MODEL OF CHOICE**

The DR processes of existing DR models illuminate the pragmatic characteristics and outputs framing my DR model of choice. Being pragmatic in nature, different DR models essentially display characteristics that focus on the output’s practical usability.

This involves a pragmatic exploration of the fit-for-purpose processes, sub-processes and products relevant to the educational problem, and the end user’s contextualised needs (Ornstein & Hunkins, 2014). As such, pragmatism views truth as what works at the time,

providing the researchers with the freedom to select the methodological 'how' and 'what' to research (Creswell, 2007).

### **2.5.1 Pragmatic decisions**

Processes and products, or the 'how' and 'what' explored within DR models refer to my selection of procedural heuristics. These represent my DR process and my selection of substantive heuristics that represent the characteristics of my intervention. I conceptualised both sets of heuristics pragmatically.

In order to conceptualise my *procedural heuristics* (Figures 2.3 and 2.5), I selected and combined activity-based processes from DR models relevant to the problem of fostering teachers' EI and their contextualised EI needs.

Pragmatic selections and combinations firstly related to my procedural heuristics' activity-based processes. Adhering to non-technical/non-scientific characteristics, I included a subjective and contextualised analysis of teachers' needs, which I generated through in-depth interviews. In addition, and further strengthening the subjective, emergent and unpredictable nature of my procedural processes, I allowed for emergent categories from the interview transcripts analysed. For quality purposes, I furthermore included subjective researcher screenings as a formative evaluation method to determine the relevance, fairness and comprehensiveness of my envisaged intervention. In contrast, adhering to technical/scientific characteristics, I relied on theoretically-grounded objectives and the scientific literature relevant to the problem of fostering teachers' EI and their contextualised EI needs. I also theoretically grounded parts of my analysis of teachers' needs in pre-figured categories from the literature review. I finally planned for objectives and predictable experimental research to determine my intervention's effectiveness during a second future study.

Pragmatic selections and combinations secondly related to the overall procedural heuristic process followed. Adhering to non-technical/non-scientific characteristics, I regarded the development process as fluid and adaptable based on continuously emergent information from the activity-based processes followed (Wang & Hannafin, 2005). This means that I made provision for an iterative (Ellington et al., 1996), evolving, and at times subjective process (Ornstein & Hunkins, 2014). This allowed me to adapt previous decisions with regard to my procedural and substantive heuristics. In contrast, adhering to technical/scientific characteristics, I followed a logical and systemic input-process-output system's approach to ensure maximum efficiency and rigour (Ornstein & Hunkins, 2014) in delivering quality outputs.

Each activity-based process followed refined my procedural heuristics, resulting in a set of research-based heuristics that can be tested empirically in a second future study (Plomp, 2013). As such, my future final output would be a prescriptive and logical set of technical/scientific-orientated, procedural heuristics.

I applied the procedural substantive heuristics to develop my envisaged intervention, which entailed the conceptualisation of substantive heuristics. As such, I equally generated my own **substantive heuristics** (Figure 3.7, Chapter 3; Figure 4.5, Chapter 4) from a pragmatic selection of information. In order to conceptualise these substantive heuristics, I selected and combined different selections from theoretical and practical sources of information relevant to the problem of fostering teachers' EI and their contextualised EI needs. Adhering to non-technical/non-scientific characteristics, I conducted a qualitative inquiry to gather subjective and contextualised information from in-service teachers' own experiences. This resulted in the collaborative construction of my substantive heuristics, specifically involving my envisaged intervention's content.

In contrast, adhering to technical/scientific characteristics, I relied on theoretically-grounded objective and scientific literature to generate and refine my substantive heuristics. As such, I generated my conjectural substantive heuristics from a selection of relevant ALT instructional suggestions, and theoretically grounded EI suggestions and ER theory. I thereafter selected theoretically-grounded serious game design strategies logically connected to my conjectural substantive heuristics. This resulted in refined substantive heuristics specifically involving my envisaged intervention's design components. As such, my future final output would be a prescriptive and logical set of technical/scientific-orientated substantive heuristics.

Employing a pragmatic approach meant that I was able to utilise the strengths of both subjectivism and objectivism (Morgan & Sklar, 2012), therefore increasing the understanding of the educational problem, as well as the validity and applicability of the research, resulting in a quality intervention (Alghamdi & Li, 2013; Gitchel & Mpofu, 2012; Morgan & Sklar, 2012; Wang & Hannafin, 2005). I selected my procedural heuristics' activity-based processes from the relevant generic DR processes represented in existing DR models.

### **2.5.2 Generic development processes**

Although a well-structured process for conducting DR has not yet been established (Alghamdi & Li, 2013), generic processes have been derived from existing models. Plomp (2013) indicates that DR models typically incorporate similar systematic development processes found in educational and instructional design, as visualised in Figure 2.1. These generic development

processes involve iterations of cyclical phases until a close relationship between the intended and attained is obtained.

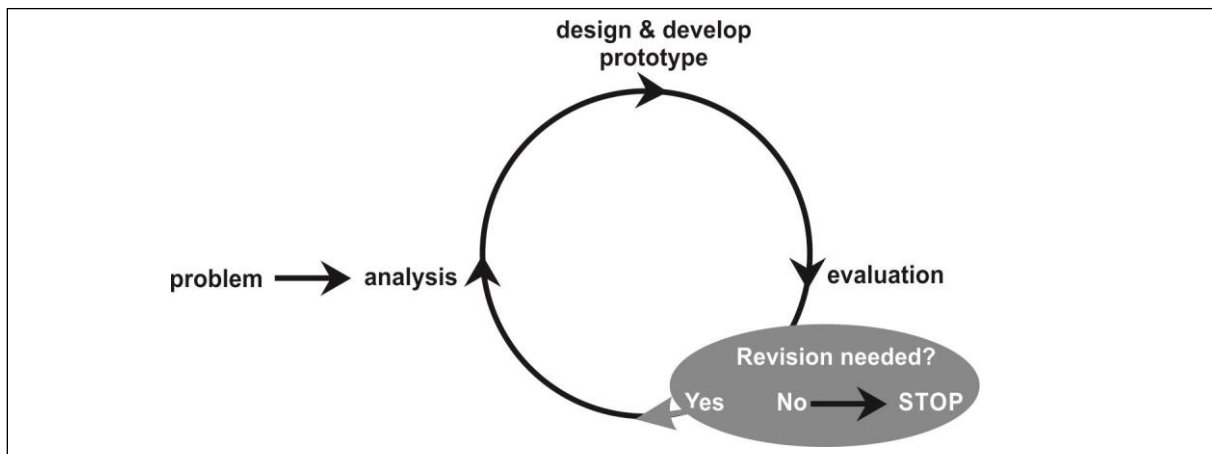


Figure 2.1: Generic systematic development processes (Plomp, 2013, p. 17)

The generic development process is characterised by cyclical and iterative phases of analysis, design, evaluation and revision activities, which are initiated by a problem to be solved (Plomp, 2013). Its cyclical nature means that each cycle has to take the findings of previous cycles into account (Plomp, 2013). This ensures that adaptations or improvements to the evolving prototype design are predominantly grounded in the continuous evaluation thereof, the revision decisions taken, and the analysis of the evaluation data (Plomp, 2013). Starting with an intended intervention, each new cycle (also called mini- or micro-cycles) refines and improves the evolving prototype until it results in a completed and implemented intervention where the intended outcomes are proven to be realised through a final evaluation (Plomp, 2013; Van den Akker, 2013). As such, each mini-cycle represents iterations prompted by evaluation results.

The advantage of Plomp's (2013) generic model is that it is primarily process-orientated (Plomp, 2013). This means that I could potentially have addressed a complex educational problem requiring several cycles of iterations before I conceptualised an optimal solution. For this reason, I used Plomp's (2013) generic characterisation of the systematic development processes as the basis of my DR model of choice. I used Plomp's (2013) model (Figure 2.1), which overlaps with the processes of existing DR models to include activity-based processes distinguishing DR models from those of educational and instructional design.

### 2.5.3 DR activity-based processes

What distinguishes DR models' processes from those of educational and instructional design are their research-orientated outputs, which are based on quality-orientated reflections and evaluations (Plomp, 2013; Thijs & Van den Akker, 2009). As research-orientated outputs

distinguish DR models from generic development processes, additional activity-based processes provide supplementary advantages. These activity-based processes and advantages are:

- An intensive and systematic initial analysis phase, consisting of both state-of-the-art literature reviews, and a needs and context analysis (Van den Akker, 2013).
- Procedural and substantive heuristics from continuous documentation and reflection, providing a broader contribution to the body of knowledge about the educational problem being solved, and the educational development processes followed (Van den Akker, 2013).
- Transparent and theory-orientated formative evaluations of the evolving heuristics, which is informed by a set of context-bound quality criteria (refer to Sub-section 2.5.4). This provides the primary emphasis for adaptations and improvements during the design phase (Thijs & Van den Akker, 2009). Subsequently, quality criteria ensure that researchers keep their focus on the appropriateness of the pragmatic decisions they make to solve the education problem effectively.
- A collaborative involvement with the end users, gearing the intervention towards their contextualised needs and consequently increasing the ownership and practical usability of the product (Parsons & Beauchamp, 2012; Thijs & Van den Akker, 2009).

Based on these advantages, I used Plomp's (2013) generic model (Figure 2.1) as the basis for combining its overlapping characteristic processes with that of three other activity-based DR models that I found useful. In particular, I used the DR models of McKenney et al. (2006), Reeves (2000, 2006), the generic prototypical model (see Nieveen & Folmer, 2013; Plomp, 2013; Thijs & Van den Akker, 2009) or generic DR activity-based processes evident in DR studies' personalised models (Plomp, 2013). As such, these overlaps and expansions informed the conceptualisation of my own adapted DR model. Although the details of the various existing models differ, the different models display overlapping activity-based processes. In addition, their predominant focus is on the output's practical usability, hence its reliance on a pragmatic exploration of fit-for-purpose processes and products (Thijs & Van den Akker, 2009).

The ***overlaps and expansions*** of the DR models that I reviewed also depict how my process went through iterative cycles of analysis and design, evaluation and revision decisions similar to Figure 2.1. At first, the analysis phase is prompted by a complex educational problem (Plomp, 2013). Proponents of DR models, including those of McKenney et al. (2006), Reeves (2000, 2006), and Van den Akker (2013), describe a number of corresponding activities appropriate to the analysis phase. These include (1) State-of-the-art literature reviews of existing interventions and potential solutions, (2) Analysis of end users' needs and contexts, (3) Consultation with

experts, which result in (4) The development of tentative substantive heuristics. Proponents of the DR models mentioned confirm that the analysis phase comprises a collaborative effort with end users, and theoretical grounding for subsequent design decisions.

The analysis phase is followed by a prototype design and development phase, an evaluation phase, and revision decisions. These processes involve an evolving prototype based on multiple iterative mini-cycles of evaluations, revision decisions and renewed analysis of the evaluation results. Each evaluation phase involves formative evaluations based on a set of quality criteria (refer to Sub-section 2.5.4), and concludes with summative or semi-summative evaluation of the completed intervention (Plomp, 2013).

Proponents of the mentioned DR models describe corresponding mini-cycles of iterative formative evaluation and refinement of the design components. The intervention evolves from (1) The intended, based on existing or tentative substantive heuristics to (2) The attained, based on an analysis of the final evaluation results. Nieveen and Folmer (2013, p. 159) describe each evolution of the prototype according to the design stages of the completed product or intervention. The first stage is a design proposal constituting the analysis' result of tentative substantive heuristics. The second stage is a global design providing tentative details of the intervention's design components. The third and fourth stages constitute a partly detailed intervention and a completed intervention.

The final mini-cycle is determined by the existence of convincing evidence about the quality of the completed intervention in close collaboration with the end user (Nieveen & Folmer, 2013; Plomp, 2013; Thijs & Van den Akker, 2009). Proponents of the DR models mentioned distinguish this final evaluation as a distinct phase within the DR process. The proponents of DR models describe this phase as the formatively evaluated evolving prototype, which temporarily ends in a summative evaluation or assessment of the completed and implemented intervention. The proponents of DR models also refer to this phase as semi-summative, as it might prompt a renewed analysis or re-design on the basis of additional recommendations for improvements (McKenney et al., 2006).

The overlaps with Plomp's (2013) modelling of generic development processes as visualised in Figure 2.1, and expansions based on DR distinguishable activity-based processes, informed the conceptualisation of *my own adapted and combined DR model* as visualised in Figure 2.2. I first selected activity-based processes from each overlapping phase that I found relevant to my educational problem and the contextualised needs of my end users. In addition, I included a mini-cycle within my (initial) review and analysis phase, which I explain further on.

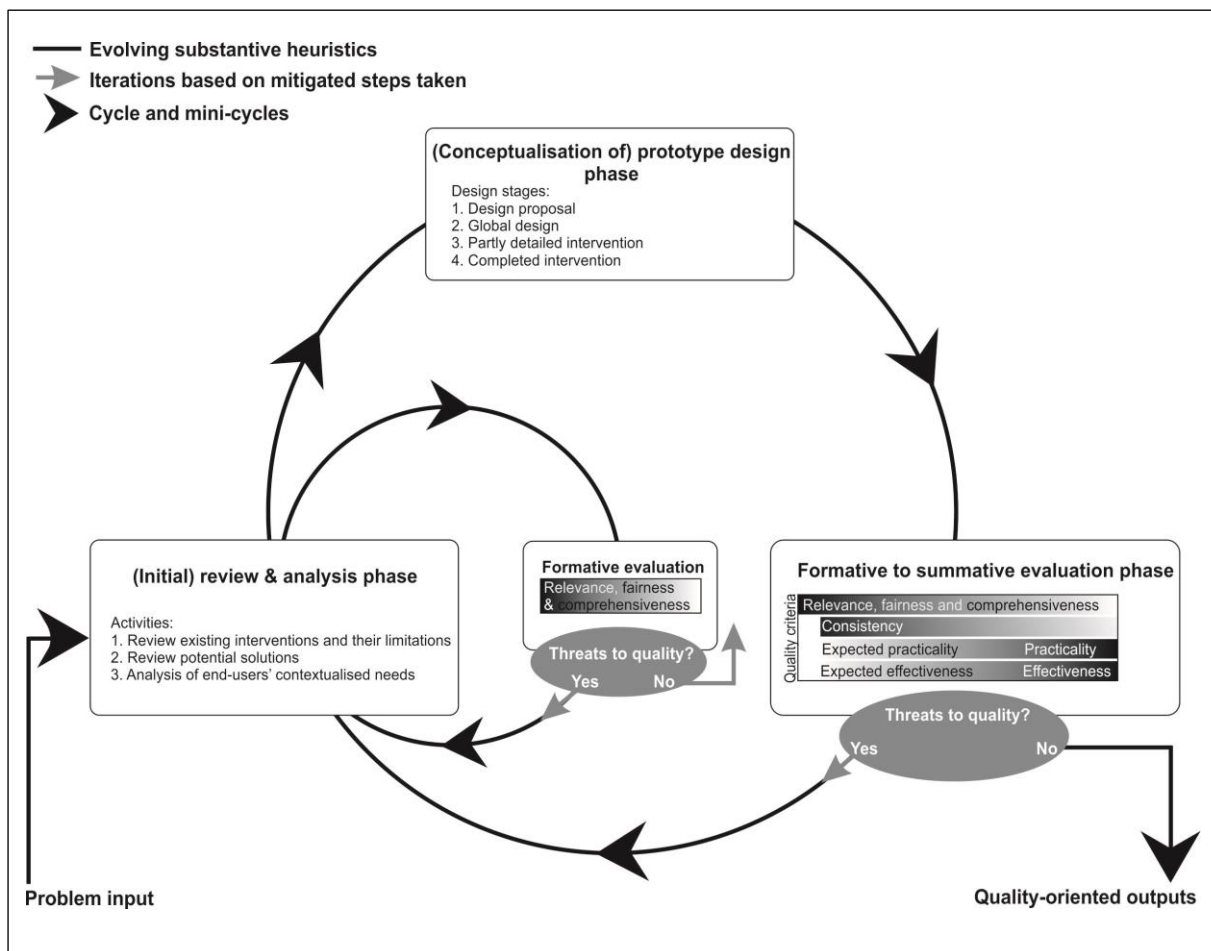


Figure 2.2: My DR process model (adapted from Plomp, 2013, p. 17, and combined with McKenney et al., 2006; Nieveen & Folmer, 2013; Plomp, 2013; Reeves, 2000, 2006; Thijs & Van den Akker, 2009)

My DR process model was initiated by the educational problem of fostering teachers' EI. From this input, I conducted two mini-cycles of the DR process. My first cycle of reviews and analysis, prototype design, and formative evaluation prompted an additional iterative mini-cycle based on formative threats to my first prototype that I identified. I plan to conduct multiple mini-cycles in a future second study, ending in a summative evaluation of the completed intervention. As I conducted only two mini-cycles in this study, I refer to my initial review and analysis phase, and my conceptualisation of the prototype design phase.

In addition, I included a mini-cycle within my initial review and analysis phase. This mini-cycle involves three initial review and analysis activities, which I formatively evaluated at the completion of each activity, and which prompted iterative continuation of this mini-cycle. In common DR practice, only the evolving prototype design is subjected to quality-orientated evaluations (McKenney et al., 2006; Plomp, 2013; Reeves, 2006). I decided to include formative evaluations of my reviews and analysis based on the notion that my study ends with only one prototype design being evaluated. Dividing my research project into two distinct studies and

including formative evaluations within my initial review and analysis phase allowed me to focus on the accuracy and depth of activity-based processes. This may have increased the quality of the heuristics that I generated, and ultimately the effectiveness of the implemented intervention (Edmonds et al., 1994).

My initial review and analysis phase involved three activities. I conducted these activities to generate a set of substantive heuristics in the form of a design proposal. This proposal provided theoretical grounding for design decisions, insight into the educational problem of fostering teachers' EI, and potential solutions for improvement. For this purpose, I reviewed existing EI practices and their limitations, as well as potential EI, ER and serious game strategies. I also analysed teachers' contextualised ER needs informing my evolving substantive heuristics. I actively collaborated with my end-users, in-service teachers, during this phase, which increased the likeliness of a quality-orientated intervention (Plomp, 2013). I continuously reflected on, and formatively evaluated the quality of the evolving heuristics generated from these activities, based on a particular quality criterion. From my evaluation, I identified potential threats allowing for iterative mitigating actions until I produced a quality-orientated design proposal.

My conceptualisation of the prototype design phase involved only a first conceptual prototype and an iterative formative evaluation of both the processes that I followed (procedural heuristics) and the tentative end-product of my envisaged ER serious game concept (substantive heuristics). In design terms, I concluded my study with a quality-orientated global design, which I formatively evaluated based on a set of quality criteria. In this way, I was able to produce quality-orientated outputs during each iterative mini-cycle, as visualised in Figure 2.2.

#### **2.5.4 Quality criteria and outputs**

By applying transparent quality reflections and formative evaluations visualised in Figure 2.2, I attempted to increase the likeliness of yielding quality-orientated outputs that are theoretically-grounded (McKenney et al., 2006; Plomp, 2013), as opposed to adopting a non-critical approach to theoretically un-grounded outputs (Carl, 2012).

The outputs generated in this study coincide with the dual aim of this study. Based on the systematic reflection and documentation of activity-based processes followed in my DR model, I generated and refined a set of research-based substantive and procedural heuristics as outputs (Plomp, 2013). My evolving heuristics subsequently enabled my first aim, to develop a conceptual contextualised EI intervention. It also enabled my second aim, to contribute to the knowledge base on the educational problem of fostering teachers' EI, as well as to the field of educational development. Although my heuristics are currently justified by theoretical



arguments, I need to justify their implemented practicality and effectiveness with empirical evidence (Plomp, 2013). As such, I intend to test my heuristics empirically as part of a second future study.

A strict set of quality criteria for DR has not yet been established (Alghamdi & Li, 2013). However, the pragmatic nature of DR allowed me to consider both an empirical (Design-Based Research Collective, 2003) and context-dependent (O'Donnell, 2004) quality determination. This implies consideration of empirical validity, reliability and objectivity criteria; and, for example, Guba and Lincoln's (2008) trustworthiness - and authenticity criteria for meeting context-dependent quality standards. However, DR authors (e.g., Alghamdi & Li, 2013, Plomp, 2013) agree that DR poses unique challenges threatening the quality of its findings. For this reason, I decided to apply the quality criteria suggested by Nieveen and Folmer (2013), as supported by Plomp (2013) and Van den Akker (2013).

In order to yield quality-orientated outputs, Nieveen and Folmer's (2013) proposed quality criteria accounts for DR's evolving nature through formative evaluation within each iterative cycle. Throughout the development process, the quality criteria shifted in emphasis from evaluating the intervention's (1) Relevance (including fairness and comprehensiveness), to its (2) Consistency, to its (3) Practicality, and finally its (4) Effectiveness (Thijs & Van den Akker, 2009). DR's pragmatic nature is furthermore evident in the methods recommended to infer each quality criterion (see Sub-section 2.5.1). I applied quality reflections and formative researcher screenings to infer the following quality criteria that I aligned to this study:

1. Relevance, fairness and comprehensiveness (also known as content validity), which refers to the extent to which the intended intervention is perceived to be a relevant improvement or contribution to existing EI practices of teachers (Van den Akker, 2013). This criterion therefore implies the confirmation of a real need for my envisaged intervention. This criterion furthermore implies that its design is based on state-of-the-art information from the literature (Nieveen & Folmer, 2013). Content validity particularly deals with the actual defined content being addressed in a fair and comprehensive manner (Cohen et al., 2011; Edelson, 2006). In order to account for these interpretations of relevance and content validity, I firstly considered my evolving intervention's relevance to teachers' contextualised needs, as well as to my instructional ALT suggestions generated. Secondly, I considered covering state-of-the-art information from the literature in a fair and comprehensive manner (Cohen et al., 2011; Nieveen & Folmer, 2013). This means that if comprehensive coverage of the main domain or issue wasn't practical, my selected elements were a fair representation of the wider domain or

issue, and that I addressed my selected element(s) in a comprehensive manner (Cohen et al, 2007, 2011).

2. Consistency (also known as construct validity) refers to the extent to which the design components are logically and coherently linked to each other (Nieveen & Folmer, 2013). Construct validity in this study particularly deals with the construct (content created) being an acceptable portrayal of its underlying construct (theoretical or participants' construction) in a way that encourages meaningfulness and a clear understanding for the participants themselves (Cohen et al., 2007, 2011). In order to account for these interpretations, I formatively evaluated (1) The design components interconnectedness (Van den Akker, 2013), (2) The design components' consistency with future-orientated design guidelines (Carl, 2012; Ornstein & Hunkins, 2014), and (3) The construction of the intervention's content as an acceptable portrayal of its underlying theory and the participants' expressed experiences (Cohen et al., 2007, 2011).
3. Expected practicality, which refers to the extent to which the envisaged intervention is expected to be usable in the contextual setting for which it was developed (Nieveen & Folmer, 2013). Usability also relates to the heuristics' generalisability. Although the heuristics generated in DR primarily apply to the contextual setting these were intended for (McKenney et al., 2006), I aimed to account for the possibility to cumulatively apply the heuristics to similar contexts, therefore strengthening their generalisability (Edelson, 2006). I also aimed to account for the possibility to analytically generalise the heuristics. This means that I would potentially be able to purposefully transfer and validate the existing heuristics to other common EI facets from the outset of the development process (Alghamdi & Li, 2013; Herrington et al., 2007; Plomp, 2013).
4. Expected effectiveness, refers to the extent to which the envisaged intervention is expected to result in the intended outcomes (Nieveen & Folmer, 2013). This implies that the teachers' expressed experiences and learning outcomes are congruent with my global design's intended aim and goals, including the effectiveness of its scalability and sustainability (Plomp, 2013; Thijs & Van den Akker, 2009; Van den Akker, 2013).

The purpose of the quality-orientated reflections and formative evaluations was to confirm and improve the evolving heuristics' quality linked to the quality criteria emphasised in each cycle. Formative evaluations provided structured moments for modifications and improvements (McKenney et al., 2006). These structured moments enabled me to consistently and transparently connect potential threats to my heuristics' quality, and to implement iterative mitigated actions to modify and improve my heuristics' quality (Thijs & Van den Akker, 2009). The manner in which I applied the quality criteria and adapted and combined the DR model in

this study is represented in my procedural conceptual framework, which is discussed further on.

## 2.6 APPLICATION

The particular way in which I applied this study’s DR phases, cycles, and quality outputs encapsulates my personalised procedural conceptual framework. This framework also represents my procedural heuristics for developing an EI intervention in the form of an ER serious game for teachers. In Figure 2.3, I visualise the systemic and iterative nature of my procedural conceptual framework.

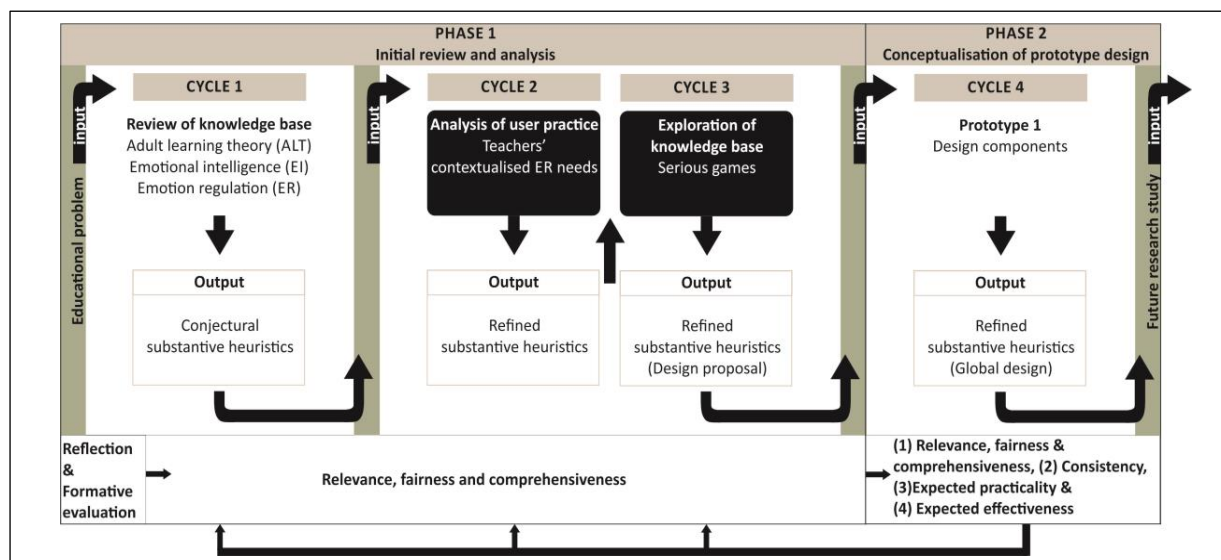


Figure 2.3: Procedural conceptual framework (adapted from Dowse & Howie, as cited in Plomp, 2013, p. 41)

The three cycles that constituted Phase 1 of my initial review and analysis phase, and the one cycle conducted as part of my conceptualisation of the prototype in the design phase are represented in Figure 2.3. DR’s pragmatic nature is evident in the input-process-output system’s approach followed within each cycle; and the provision for iterative, evolving, and at times subjective activity-based processes (refer to Sub-section 2.5.1).

The educational problem served as the input that prompted my research, and subsequently, Phase 1 and Cycle 1. I produced a set of conjectural substantive heuristics from a review of the knowledge base of adult learning, EI and ER. Cycle 1’s output, in turn, prompted an analysis of the teachers’ contextualised ER needs (Cycle 2) and an exploration of the knowledge base of serious games (Cycle 3). The processes followed within Cycles 2 and 3 produced refined substantive heuristics as respective outputs. As such, Phase 1 concluded with a set of refined substantive heuristics in the form of a design proposal. In design terms, a design proposal is a

general description of the intended intervention based on the first phase's initial review and analysis results. This is focused on the substantive design components (Nieveen & Folmer, 2013).

The design proposal served as an input for Phase 2 and Cycle 4, which entailed the conceptualisation of my first prototype design for an ER serious game for teachers. As such, my final output for a future study was a set of refined substantive heuristics in the form of a global design. In design terms, a global design provides tentative ideas or a brief description of some or all of the design components of the future intervention. This gives an idea of how I envisaged the intervention (Nieveen & Folmer, 2013).

I reflected on and formatively evaluated my evolving heuristics. As indicated in Figure 2.4, I conducted these two quality-orientated activities during and after Cycles 1-4.

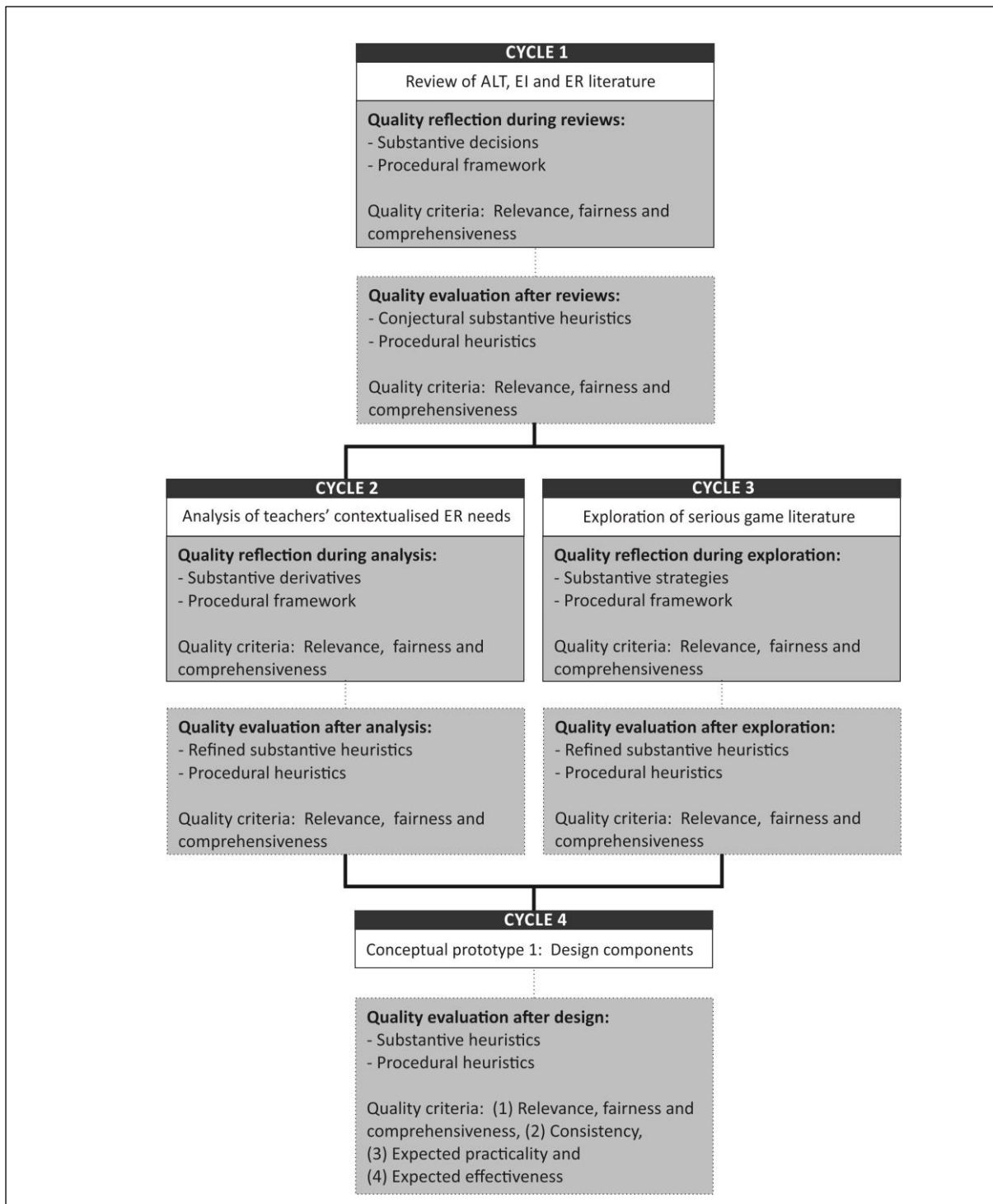


Figure 2.4: Quality-orientated activities conducted during and after Cycles 1-4

I conducted quality-orientated reflections during Cycles 1-3. This entailed Cycle 1's conjectural substantive decisions and the subsequent procedures that prompted Cycles 2 and 3. This in turn prompted Cycles 2 and 3's substantive refinements and their associated procedures embedded in Cycle 4's global design. I furthermore conducted formative evaluations after Cycles 1-4 to confirm and improve the evolving heuristics' quality.

During Phase 1 (Cycles 1-3), I focused on the relevance, fairness and comprehensiveness of the theoretical and practical sources used, as discussed in Chapters 3 and 4 (Sub-sections 4.3 and 4.4). During Phase 2 (Cycle 4), I focused primarily on establishing and confirming the global design's (1) Relevance, fairness and comprehensiveness, and (2) Consistency, as discussed in Chapter 4 (Sub-section 4.5). In addition, I considered the global design's (3) Expected practicality and (4) Expected effectiveness. These considerations concur with Thijs and Van den Akker (2009) and Plomp's (2013) recommendation to focus predominantly on an intervention's relevance (including fairness and comprehensiveness) during the early cycles of the DR process.

I attempted to increase theoretically-grounded transparency by documenting the quality-orientated reflections that I conducted in Cycles 1-3. I furthermore attempted to increase the theoretically-grounded transparency of my formative evaluations by generating researcher screening checklists (Appendices A-D) (Nieveen & Folmer, 2013; Thijs & Van den Akker, 2009). Researcher screening constitutes the method I decided to use to conduct my formative evaluations. The method of researcher screening entails the researcher checking off important component characteristics of an evolving intervention (Nieveen & Folmer, 2013). These checklists assisted me in keeping my focus on the particular issues at hand. This then contributed to the consistency and systematicity of my formative evaluations. I could therefore rely on them to provide transparent reasons for the modifications and improvements that I made (Bakker & Van Eerde, 2015). In addition, my checklists helped me to identify and confirm important characteristics of my evolving intervention.

Initially, I considered the alternative formative evaluation methods recommended by DR authors (e.g. Nieveen & Folmer, 2013; Thijs & Van den Akker, 2009). These included, for example, expert appraisals, walkthroughs, try-outs and empirical research conducted by the researcher, external role-players and the end-users. However, I decided to use researcher screening as it concurs with DR authors' (Nieveen & Folmer, 2013; Thijs & Van den Akker, 2009; Van den Akker, 2013) recommendation to employ researcher screening during early DR cycles, as the main evaluative purpose is to locate shortcomings and to generate improvements. Being the researcher and developer in this study, this meant that I was able to iteratively fast-track the modifications to the heuristics needed in my evolving intervention (McKenney et al., 2006; Plomp, 2013). This also meant that I was able to document when and how my own agenda may have influenced the development process (Hoadley, 2004; McKenney et al., 2006).

I compiled my own screening checklists, which were linked to the quality criteria emphasised in each cycle, from educational research and the DR literature. In this manner, I attempted to account for typical threats to traditional research or development practices' quality, including

neglecting important descriptive information, as well as non-typical threats that are unique to DR studies, including having to continuously re-visit previous information (Alghamdi & Li, 2013, McKenney et al., 2006; Plomp, 2013).

In practice, I was able to apply the procedural conceptual framework by following my system’s approach systematically, and by allowing for reflective evaluative iterations based on the evolving quality-orientated heuristics. In the following sections, I discuss each phase and cycle, focusing on my methodological research and design activities, as well as the formative evaluations conducted. As visualised in Figure 2.5, the discussion of research and design activities further represents the application of my procedural conceptual framework.

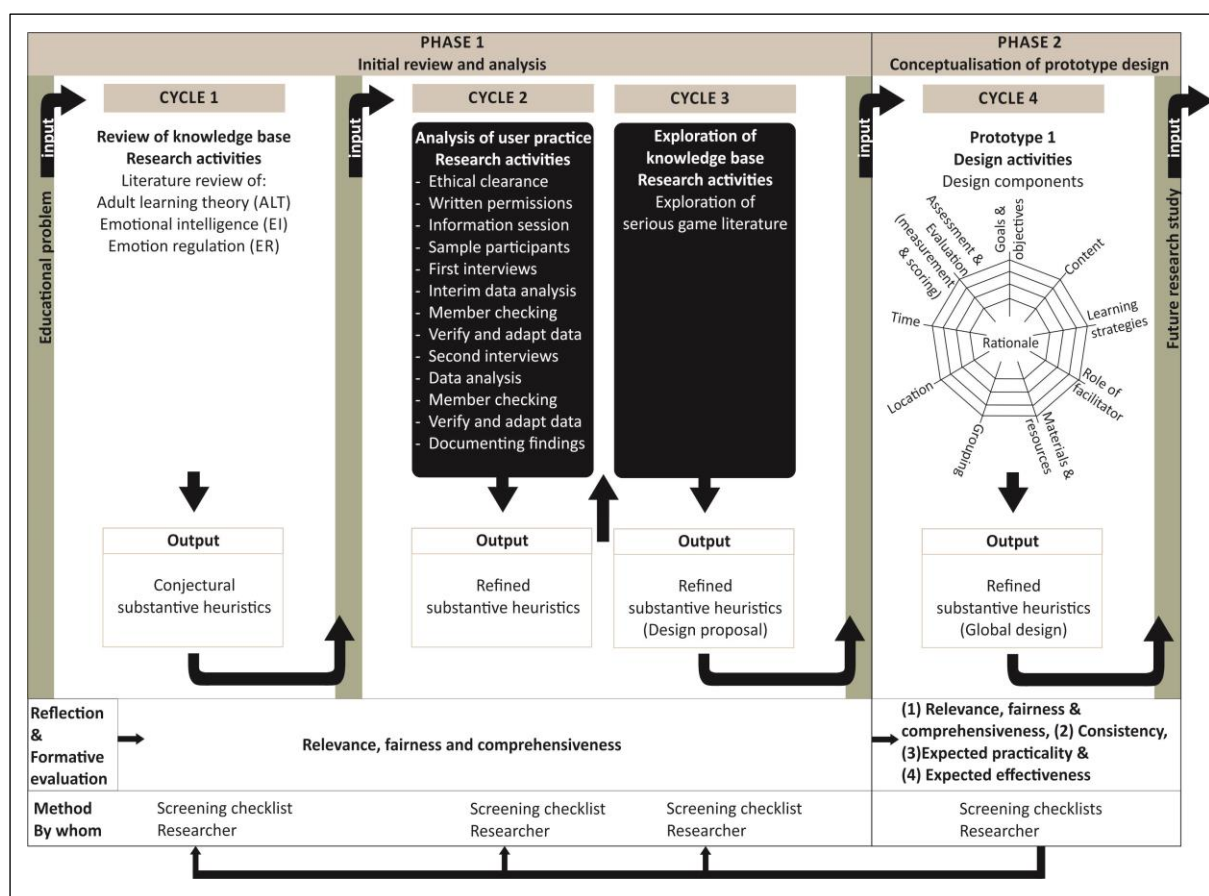


Figure 2.5: Procedural conceptual framework (adapted from Dowse & Howie, as cited in Plomp, 2013, p. 41; and Van den Akker, 2013, p. 59)

### 2.6.1 Phase 1: Initial review and analysis

Phase 1 of the DR process constituted the initial review and analysis phase. The purpose of Phase 1 was to generate a set of refined substantive heuristics in the form of a design proposal, which provided the theoretical grounding for the design decisions made in Phase 2; insight into

the educational problem of fostering teachers' EI; and potential solutions for improvement. Phase 1 consisted of three cycles, which I subsequently discuss in more detail.

### **2.6.2 Cycle 1: Review of adult learning, EI and ER knowledge base**

Cycle 1 in this process entailed a review of the theoretical knowledge base of adult learning, EI and ER in relation to the educational problem of fostering teachers' EI. The **focus** of Cycle 1 was to generate a set of quality-orientated conjectural substantive heuristics from the ALT, EI, and ER literature that might potentially ensure an effective ER intervention contributing to teachers' EI.

During Cycle 1, my **intention** was to generate adult learning instructional heuristics for an effective intervention for teachers. This process included the illumination of existing delimiting factors of current EI practices. This further meant selecting alleviating suggestions from EI contributors, which necessitated an additional review of ER theory and research. This enabled me to formulate conjectures, defining clear and appropriate substantive heuristics (Figure 3.7, Chapter 3). These heuristics prompted two all-encompassing conjectural decisions, which involve (1) The employment of teachers' own ER experiences as learning opportunities, and (2) The integration of the intervention into teachers' real-life through the application of a serious game for training, measurement and scoring purposes.

My **research strategy** in this instance firstly entailed a literature review of ALT. I conducted this review to gain theoretical and practical insight into instructional heuristics that might increase the effectiveness of an intervention aimed at teachers. I secondly conducted a literature review of EI theory to ensure a theoretically grounded intervention. I then reviewed the literature on existing EI measurement and scoring practices as this allowed for (1) A customised approach to learning, operationalised by continuously measuring and scoring individual needs, (2) A means to infer if learning is taking place, and (3) A means to validate the effectiveness of my envisaged intervention. From the EI literature, I illuminated existing EI practices' delimiting factors, as well as EI contributors' alleviating suggestions to combat the existing limitations. EI suggestions prompted a conjectural decision to focus on ER as a common facet of EI. As such, I thirdly reviewed the ER literature, which comprised ER theory, as well as existing ER research geared towards teachers. These literature reviews finally informed the conjectural substantive heuristics to be embedded in the design components of my envisaged intervention.

To guide the **quality** of my evolving intervention and to generate improvements (Thijs & Van den Akker, 2009), I conducted two quality-orientated activities (see Figure 2.4). I first continuously reflected on the relevance, fairness and comprehensiveness of the conjectural substantive decisions during the ALT, EI and ER reviews, and subsequently modified the



procedural framework accordingly. I document the quality-orientated reflections in Sub-sections 3.4.1 and 3.4.2 (Chapter 3). I secondly formatively evaluated my conjectural substantive heuristics and Cycle 1's procedural heuristics. For this purpose, I conducted a screening, which entailed checking off important component characteristics of the evolving intervention (Nieveen & Folmer, 2013). This allowed me to iteratively fast-track the modifications to my heuristics as needed in the evolving intervention (Thijs & Van den Akker, 2009; Nieveen & Folmer, 2013).

During Cycle 1, I focused on the quality criteria of relevance, fairness and comprehensiveness (refer to Sub-section 2.5.4). This meant that I aimed to determine if my envisaged intervention might be a relevant improvement to existing ER practices found amongst teachers (Nieveen & Folmer, 2013; Plomp, 2013). Practically, I compiled a formative checklist (Appendix A) of potential threats, which enabled me to determine (1) If my heuristics were relevant (Nieveen & Folmer, 2013) to teachers' contextualised needs, as well as to my instructional ALT suggestions generated; and (2) If I covered state-of-the-art information from ALT, EI and ER literature in a fair and comprehensive manner (Cohen et al., 2011; Nieveen & Folmer, 2013). I compiled the checklist from existing DR literature (Alghamdi & Li, 2013; Herrington et al., 2007; McKenney et al., 2006; O'Donnell, 2004; Phillips, 2006; Plomp, 2013; Wang & Hannafin, 2005), as well as existing educational research literature (Cohen et al., 2011; Ross et al., 2008).

Using my checklist (Appendix A), I identified four potential threats and subsequently attempted to incorporate mitigating steps to improve the evolving heuristics, which I meticulously documented in my Field Notes (Appendix P). The potential threats identified as such primarily related to:

- The omission of relevant information (Cohen et al., 2011; Herrington et al., 2007; McKenney et al., 2006; O'Donnell, 2004; Wang & Hannafin, 2005) with regards to EI and ER literature.
- The subjective nature of my role as the researcher, designer and evaluator (McKenney et al., 2006; Plomp, 2013; Ross et al., 2008; Wang & Hannafin, 2005).

An all-encompassing conjectural decision that I evaluated in Cycle 1's substantive heuristics (Figure 3.7, Chapter 3) prompted Cycle 2 of my DR process. This decision implied that I employed teachers' own ER experiences as learning opportunities, which prompted an analysis of the teachers' contextualised ER needs.

### 2.6.3 Cycle 2: Analysis of the end user's practice

Cycle 2 in this process entailed an analysis of in-service teachers' contextualised ER needs. The **focus** of Cycle 2 was to derive and generate a set of quality-orientated and refined substantive heuristics (Figure 4.5, Chapter 4) informed by teachers' expressed ER experiences and practices. In an effort to inform the ER process (Figure 3.5, Chapter 3) derived from Gross (1998a, 1998b) ER theory, I gathered information about authentic real-life context-bound:

1. Emotion-triggering situations.
2. Emotion regulatory goals activated.
3. ER strategies employed to achieve regulatory goals activated.

During Cycle 2, my **intention** was to generate relevant, fair and comprehensive content that was based on teachers' prior knowledge related to their ER experiences. This was the basis for an authentic context for the design of an effective ER intervention that contributes to teachers' EI. As such, my ER intervention's content could potentially contribute to:

- Increasing, measuring and scoring teachers' ER.
- Alleviating the particular EI limitations identified.
- Addressing the ER critical need of teachers (Brackett et al., 2013).
- Expanding the largely unexplored field of teachers' ER (Gong et al., 2013; Thory, 2013).

My **research strategy** in this instance entailed a qualitative investigation of teachers' contextualised ER needs. I regarded this strategy as the most appropriate (Nieveen & Folmer, 2013), as it allowed me to generate context-specific information about teachers' real-life ER experiences from their own unique perspectives (Mustafa, 2011; Morgan & Sklar, 2012; Nieuwenhuis, 2007a). As such, Cycle 2 constituted a systematic inquiry into the subjective, socially constructed, in-depth, and personal ER information that could potentially form the basis of my ER intervention's content. As summarised in Figure 2.6 and subsequently described, I systematically followed the methodological research activities listed. I based these activities on the procedural conceptual framework visualised in Figure 2.5 to guide my analysis of the end users' practice.

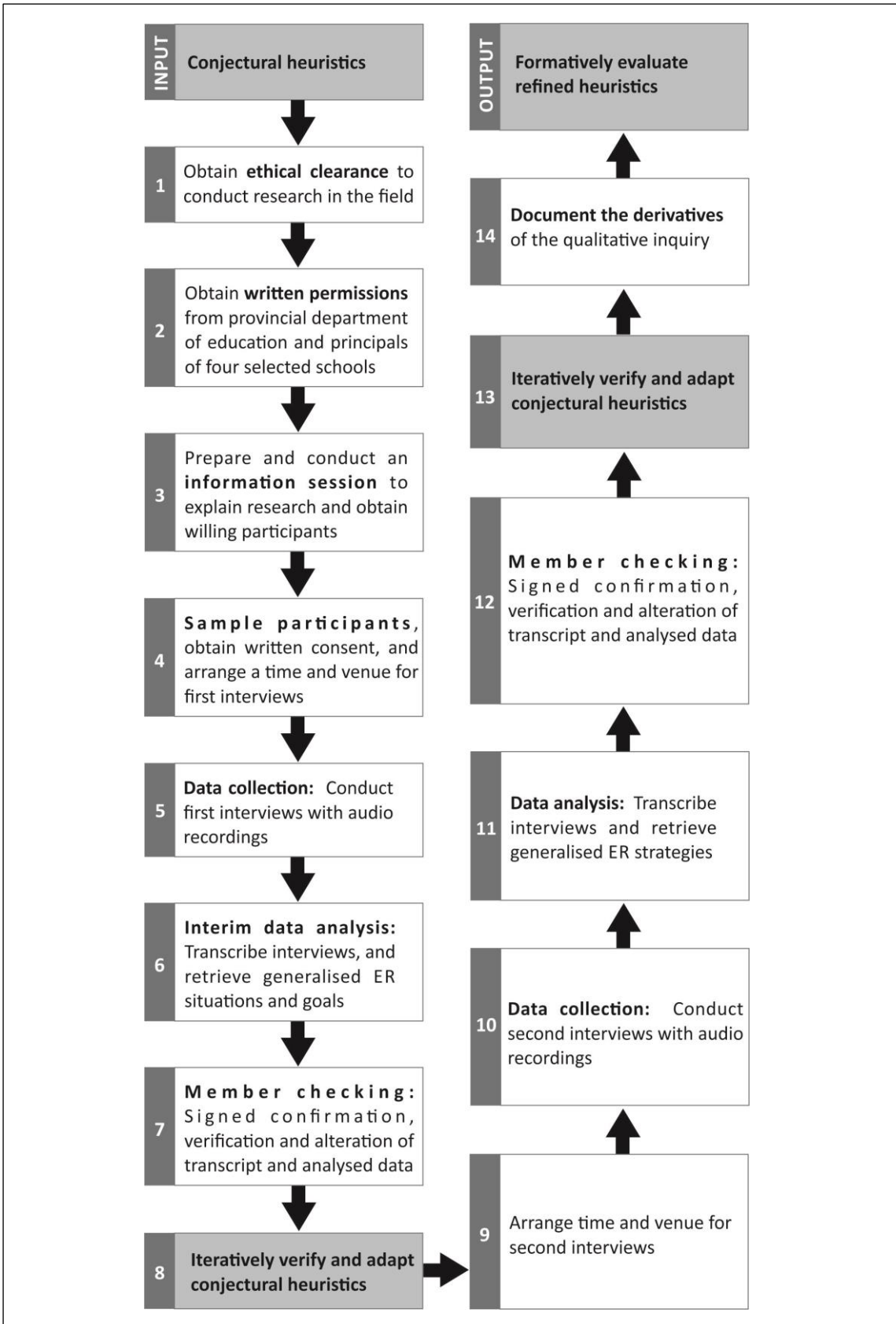


Figure 2.6: Systematic methodological research activities for analysing the user practice

DR's pragmatic nature is evident in the methodological research activities summarised in Figure 2.6 (refer to Sub-section 2.5.1). Prompted by Cycle 1's quality-orientated conjectural heuristics, I conducted a qualitative inquiry into the end users' practice, starting with obtaining ethical clearance for this research.

### **Activities 1-3: Ethical clearance, written permissions and information sessions**

In accordance with the regulations of the University of Pretoria, the Cycle 2 research activities summarised in Figure 2.6 were preceded by obtaining ethical clearance, written permissions and information sessions conducted at each participating school. The ethical considerations to ensure that this research process would be fair and ethical included obtaining (1) Informed consent from the selected participants, (2) Protecting their privacy, confidentiality and anonymity, and (3) Ensuring reasonableness and fairness (Appendix E).

I furthermore obtained written permission from the Bojanala district Department of Education (Appendix F), as well as the four headmasters of the participating schools (Appendix G). I finally conducted an information session where written informed consent (Appendix H) was obtained from the 16 teachers who were willing to participate.

### **Activity 4: Sampling of the participants**

My sampling procedure entailed the selection of schools and subsequently the selection of teachers. I conducted convenience and purposive maximum variation sampling to select four schools. While purposive sampling provided me with depth of information, maximum variation provided greater strength to the data (Cohen et al., 2011; McMillan & Schumacher, 2006). I conveniently selected four North-West public secondary schools within the Madibeng district by applying the criteria of the schools' accessibility and availability (Cohen et al., 2011; Maree & Pietersen, 2007). I furthermore used purposive maximum variation sampling based on the schools being urban or rural in terms of demographics. I based this variation factor on research from Wissing, Wissing, du Toit, and Temane (2006), and Maree and Mokhuane (2007), who found differences in the emotional well-being and challenges experienced in rural and urban contexts.

From each of these schools, I selected four willing volunteers. I conducted purposive maximum variation sampling (McMillan & Schumacher, 2006) in one school that exceeded four willing volunteers. I relied on the judgement of the headmaster to select teachers with perceived low and high ER abilities representing distinct ER variation. One teacher left the profession and discontinued participation after I concluded the first interviews. As such, my sample of 16 teachers shrank to 15 teachers for the second round of interviews. On the basis that I used the

data collected during my second interviews to saturate pre-figured categories from ER theory, I discarded this occurrence as having no significant influence on my inquiry's derivatives.

### **Activity 5: Data collection, first round of interviews**

I conducted the first round of semi-structured individual interviews (Appendix I) to gather information about the context-bound ER situations and goals experienced by the participating teachers. My intention was to generate relevant, fair and comprehensive content on which to base the ER intervention's training, measurement and scoring. I planned to base the content on the ER process (Figure 3.5, Chapter 3) derived from Gross' (1998a, 1998b) ER theory. Therefore, the first round of interviews included questions related to authentic real-life context-bound emotion-triggering situations, and pre-figured categories of emotion regulatory goals activated by such situations.

I furthermore included a pre-interview activity describing my adaptation of the ER process to prompt and stimulate the participants' memory (Ross et al., 2008). I discarded any information that was shared in confidence (not for public record).

These semi-structured interviews not only provided me with rich and descriptive information, but also allowed for the flexibility of probing for clarification. I simultaneously guarded against potential information overloading (Cohen et al., 2011; McMillan & Schumacher, 2006; Nieuwenhuis, 2007b). In order to strengthen the accuracy of the data, I audio recorded the interviews, which I later transcribed for analysis purposes.

### **Activity 6: Interim data analysis of the first round of interviews**

I subsequently conducted an interim data analysis of the data gathered during the first round of interviews, based on Creswell's (2007) conjoined general analytical strategy. This strategy provided me with step-by-step procedures that focused my attention on what might contribute to the relevance, fairness and comprehensiveness of the envisaged ER intervention for teachers. As such, this analytical strategy strengthened my procedural conceptual framework as it provided for a comprehensive representation of the main data analysis elements found in literature.

DR's pragmatic nature is furthermore evident in my analysis strategy, which relied on both pre-figured categories from theory, as well as emergent categories from the analysed data (refer to Sub-section 2.5.1). I executed the following steps as suggested by Creswell (2007, p. 151):

1. I organised the transcribed data by breaking it down into relevant text units, such as sentences or words, indicating particular ER situations or goals experienced by the

participating teachers. For example, occurrences in the transcripts where an interviewee used words such as “decrease the doubt” (Table 4.4, Chapter 4). This helped me to separate significant or relevant data from insignificant or irrelevant data concerning my inquiry.

2. I read through the data to ensure that I understood the bigger picture of what the participating teachers meant through the broken-down text units. Based on this understanding, I conducted memos by highlighting key concepts or significant text.
3. I produced generalised descriptions of the context-bound ER situations and goals through a classification system. I based this on a combination of pre-figured categories from Gross’s (1998a, 1998b, 2014) ER theory and the emergent categories from the data. This helped me to classify context-bound ER situations according to emerging themes, such as interpersonal conflict with a colleague. In turn, it helped me to classify context-bound ER goals according to the pre-figured categories from Gross’s (1998a, 1998b, 2014) ER theory (Figure 3.5, Chapter 3; Table 4.3, Chapter 4). In some instances, I adapted or disregarded particular ER situations to ensure the anonymity of the participants, and to ensure that similar situations could be represented in my ER serious game. This provided me with potential content for the envisaged ER intervention. While emerging themes provided me with contextualised information relevant to the teachers’ actual experiences, theory-based pre-figured categories provided me with theoretically-grounded information.
4. I represented the generalised descriptions in table format (Appendix L) according to the themes and sub-themes from the ER process (Figure 3.5, Chapter 3) derived from Gross’s (1998a, 1998b) ER theory. This representation helped me to keep track of the interconnectedness of the different themes.

I executed step 5 of Creswell’s (2007) analytical strategy during Activity 7 of the systematic methodological activities. This entailed the participating teachers’ input in the form of member checking.

### **Activity 7: Member checking**

In an effort to guard against bias and subjectivity in my role as the researcher, designer and evaluator, Creswell’s (2007, p. 151) analytical strategy guided me to incorporate participant member checking (Creswell, 2007). I shared the original transcripts and representations with each participating teacher to confirm and validate the accuracy of the transcripts, as well as my understanding of the information shared. The participating teachers were allowed to alter any

information that they had given. All of the participating teachers verified and accepted the transcripts and representations without any adaptations or rejections.

From the analysed and verified data, which relates to the content on which I based my ER training, measurement and scoring, I iteratively evaluated my conjectural decisions taken during Cycle 1. This helped me to identify a potential weakness, which I describe in more detail in Activity 8 and Chapter 4. I subsequently revisited my conjectural substantive heuristics and adapted these accordingly.

### **Activity 8: The iterative verification and adaptation of conjectural heuristics**

Based on the cyclic and iterative nature of this DR process, I was able to adapt earlier decisions that might negatively have impacted my intended vision (Wang & Hannafin, 2005).

I specifically adapted my conjectural decision with regard to context-bound ER goals to be represented in my ER serious game, which I describe in more detail in Chapter 4. My decision was based on my interim analyses, which illuminated the importance of:

- The need to prioritise particular ER goals based on identified ER needs (Sutton, 2004); and
- The possibility of disregarding particular ER goals based on their lack of practical implementability (Nieveen & Folmer, 2013).

Considering the adaptations to my conjectural substantive heuristics, I carefully structured my second interview questions with the analysed, generalised, verified and adapted ER information. This provided for less bias and subjectivity during my second round of interviews (McKenney et al., 2006).

### **Activities 9 and 10: Data collection and second round of interviews**

I first arranged times and venues for my second round of audio-recorded interviews. I thereafter conducted semi-structured individual interviews (Appendix J). These incorporated interview questions representing the participating teachers' analysed, generalised, verified and adapted responses to the first round of interview questions.

My intention was to generate relevant, fair and comprehensive content on which to base my ER interventions' training, measurement and scoring. As I planned to base the content on the ER process (Figure 3.5, Chapter 3) derived from Gross's (1998a, 1998b) ER theory, the second round of interview questions related to the authentic context-bound ER strategies employed by

the participating teachers to regulate particular emotions triggered within particular ER situations.

### **Activity 11: Data analysis of the second round of interviews**

I conducted a data analysis of the information gathered during my second round of interviews, again based on Creswell's (2007) conjoined general analytical strategy. This strategy again provided me with step-by-step procedures that focused my attention on what might contribute to the relevance, fairness and comprehensiveness of my envisaged ER intervention for teachers.

During this analysis activity, I organised the transcribed data by identifying sentences or words indicating particular ER strategies employed by the participating teachers (Table 4.6 & 4.7, Chapter 4). I furthermore classified the teachers' ER strategies according to pre-figured categories from Gross's (1998a, 1998b, 2014) ER theory (Appendix K). This helped me to map the teachers' responses onto the ER strategies of (1) Situation selection, (2) Situation modification, (3) Attentional deployment, (4) Cognitive change, and (5) Response modulation. This provided me with potential content for my envisaged ER intervention. I again executed the final step of Creswell's (2007) analytical strategy during Activity 12 of the systematic methodological activities.

### **Activity 12: Member checking**

I shared the original transcripts with each participating teacher to confirm and validate its accuracy. The participating teachers were allowed to alter any information that they had given. The majority of the participating teachers verified and accepted the transcripts without any adaptations or rejections. In order to compensate for those teachers who did not respond to my final member checking, I took particular care in revisiting the audio data, correlating it with the transcripts. From the analysed and verified data, which relates to the content on which to base my ER training, measurement and scoring, I again iteratively evaluated my conjectural decisions taken during Cycle 1.

### **Activity 13: The iterative verification and adaptation of conjectural heuristics**

I only verified my conjectural decisions as I deemed no adaptations necessary during this activity, which I describe in more detail in Chapter 4.



## **Activities 14 and 15: Documenting and formatively evaluating the refined heuristics**

I finally documented and formatively evaluated my heuristics, which were informed and refined by the qualitative inquiry conducted. To guide the quality of my evolving intervention and to generate improvements (Thijs & Van den Akker, 2009), I again conducted two quality-orientated activities (see Figure 2.4). I first continuously reflected on the relevance, fairness and comprehensiveness of the refined substantive derivatives during my analysis, and subsequently modified my procedural framework accordingly. I documented the quality-orientated reflections in Sub-section 4.3.4 (Chapter 4). I secondly formatively evaluated the refined substantive heuristics and Cycle 2's procedural heuristics. For this purpose, I again conducted a screening as an important check-off point (Nieveen & Folmer, 2013). This allowed me to iteratively fast-track modifications to my heuristics (Thijs & Van den Akker, 2009; Nieveen & Folmer, 2013).

During Cycle 2, I again focused on the quality criteria of relevance, fairness and comprehensiveness (refer to Sub-section 2.5.4). I repeated my checklist (Appendix A) to determine (1) If my heuristics were relevant (Nieveen & Folmer, 2013) to teachers' contextualised needs, as well as to my instructional ALT suggestions generated; and (2) If I covered state-of-the-art information from the participating teachers' expressed ER experiences in a fair and comprehensive manner (Cohen et al., 2011; Nieveen & Folmer, 2013).

Using my checklist (Appendix A), I identified two potential threats and subsequently attempted to incorporate mitigating steps and meticulously documented the threats in my Field Notes (Appendix P). The potential threats identified as such primarily related to:

- The inclusion of unfounded or un-provided information (Cohen et al., 2011) with regard to my interpretation of the participants' ER strategies.
- The iterative and adaptable DR approach (Alghamdi & Li, 2013; O'Donnell, 2004; Phillips, 2006) with regard to the participating teachers' collaborative responsiveness.

Apart from initiating Cycle 2, an all-encompassing conjectural decision from Cycle 1's conjectural substantive heuristics (Figure 3.7, Chapter 3) equally prompted Cycle 3 of the DR process. This decision implied that I integrate the intervention into teachers' real-life through the application of a serious game for training, measurement and scoring purposes.

#### 2.6.4 Cycle 3: Exploration of serious games knowledge base

Cycle 3 in this process entailed an exploration of the knowledge base of serious games. The **focus** of Cycle 3 was to derive and generate a set of quality-orientated and refined substantive heuristics in the form of a design proposal (Nieveen & Folmer, 2013), which constitutes a general description of my envisaged ER serious game.

During Cycle 3, my **intention** was to generate relevant, fair and comprehensive theoretical and practical serious game design strategies. This would allow for the effective application of my envisaged intervention's design components.

My **research strategy** in this instance entailed an exploration of serious game design strategies that I found relevant to my refined substantive heuristics (Figure 4.5, Chapter 4). As such, I took into consideration the conjectural decisions produced from the ALT, EI and ER literature; as well as from the contextualised ER needs of in-service teachers. I regarded this strategy as the most appropriate (Nieveen & Folmer, 2013) as it allowed me to explore a broad spectrum of existing serious game design approaches from which to derive relevant theoretical and practical design strategies.

I made the conjectural decision to investigate the use of a serious game for the purpose of ER training, measurement and scoring, as described in more detail in Chapter 3. I made this decision as it dovetailed with the instructional suggestions given in ALT, as well as the alleviating suggestions from EI literature. In particular teachers' need to learn as part of everyday life experiences through applications such as problem-based learning, a simulation or a game (Merriam & Bierema, 2014). This implied that I needed to consider which aspects of ALT together with teachers' everyday ER experiences, would sufficiently be accommodated by serious game design strategies, which I describe in detail in Chapter 4.

I was able to gather the necessary design strategies from an existing serious game design approach, namely Kiili's (2005a, 2006) experiential gaming model, which could potentially ensure a relevant, fair and comprehensive ER serious game contributing to teachers' EI.

To guide the **quality** of my evolving intervention and to generate improvements (Thijs & Van den Akker, 2009), I again conducted two quality-orientated activities (see Figure 2.4). I first continuously reflected on the relevance, fairness and comprehensiveness of the refined substantive strategies during my exploration of serious games, and subsequently modified my procedural framework accordingly. I documented the quality-orientated reflections in Sub-section 4.4.4 (Chapter 4). I secondly formatively evaluated the refined substantive heuristics and Cycle 3's procedural heuristics. For this purpose, I again conducted a screening as an

important check-off point (Nieveen & Folmer, 2013). This allowed me to iteratively fast-track modifications to my heuristics needed in the evolving intervention (Thijs & Van den Akker, 2009; Nieveen & Folmer, 2013).

During Cycle 3, I again focused on the quality criteria of relevance, fairness and comprehensiveness (refer to Sub-section 2.5.4). This meant that I aimed to determine if the envisaged and evolving intervention in the form of a design proposal might be a relevant improvement to the existing ER practices found amongst teachers (Nieveen & Folmer, 2013; Plomp, 2013). Once again, I repeated the checklist (Appendix A) to determine, as before, (1) If my design proposal is relevant (Nieveen & Folmer, 2013) to teachers' contextualised needs, as well as to my instructional ALT suggestions generated; and (2) If I covered state-of-the-art information from serious game design literature in a fair and comprehensive manner (Cohen et al., 2011; Nieveen & Folmer, 2013).

Using my checklist (Appendix A), I identified one potential threat and subsequently attempted to incorporate mitigating steps to improve my evolving heuristics, which I meticulously documented in my Field Notes (Appendix P). The potential threat identified as such primarily related to:

- The omission of relevant information (Herrington et al., 2007; McKenney et al., 2006; O'Donnell, 2004; Wang & Hannafin, 2005) such as serious game design strategies not explored.

The formatively evaluated and refined substantive heuristics in the form of a design proposal concluded Phase 1 of my procedural conceptual framework visualised in Figures 2.3 and 2.5. As such, my design proposal contained the information needed to conceptually design the first prototype for an ER serious game for teachers.

### **2.6.5 Phase 2: Conceptualisation of prototype design**

Phase 2 of the DR process constituted the conceptualisation of a prototype design. In general, the purpose of Phase 2 was to design evolving prototypes until a completed intervention was implemented and found to be (1) Relevant (including fair and comprehensive), (2) Consistent, (3) Practical and (4) Effective in close collaboration with the end users (McKenney et al., 2006).

Within this study, the purpose of Phase 2 was to conceptually design and formatively evaluate my first ER serious game prototype from the design proposal concluded in Phase 1. As such, Phase 2 consisted of only one cycle, which I subsequently discuss in more detail.

### 2.6.6 Cycle 4: Prototype 1

Cycle 4 in this process entailed the conceptualisation of the design of prototype 1 of my envisaged intervention. The **focus** of Cycle 4 was to generate refined substantive heuristics in the form of a global design (Nieveen & Folmer, 2013). This was informed by the design proposal from Phase 1, generated through continuous documentation and iterative reflection.

During Cycle 4, my **intention** was to provide a brief description of the design components of the future intervention (Nieveen & Folmer, 2013). For this purpose, I was guided by the results from Cycle 2's qualitative inquiry and from Cycle 3's exploration of serious game design strategies, which is discussed in Chapter 4.

The **design strategy** to generate a global design encompassed a description of each design component derived from the substantive heuristics generated (Sub-sections 4.5, Chapter 4). I used Van den Akker's (2013) 'spider web' of design components visualised in Figure 2.5 to guide the design process. The envisaged design consisted of nine essential components linked to the rationale of improving teachers' ER in order to contribute to their EI. Applying the spider web of design components guided me to establish the inter-connectedness and the vulnerable nature of my design phase's substantive decisions. This meant that my design components needed to be aligned and in balance, and that a weak or missing link could have collapsed the consecutive phases such as implementation (Van den Akker, 2003).

To guide the **quality** of my evolving intervention and to generate improvements (Thijs & Van den Akker, 2009), I formatively evaluated my global design and Cycle 4's procedural heuristics (see Figure 2.4). For this purpose, I again conducted screenings as an important check-off point (Nieveen & Folmer, 2013). This allowed me to iteratively fast-track modifications to my heuristics as needed in the evolving intervention (Thijs & Van den Akker, 2009; Nieveen & Folmer, 2013).

During Cycle 4, I primarily attempted to establish and confirm the global design's (1) Relevance, fairness and comprehensiveness, and (2) Consistency. In addition, I considered the global design's (3) Expected practicality; and (4) Expected effectiveness (refer to Sub-section 2.5.4).

I firstly attempted to determine if my global design might be a relevant improvement to existing ER practices found amongst teachers (Nieveen & Folmer, 2013; Plomp, 2013). For this purpose, I repeated the checklist (Appendix A) to determine (1) If my global design is relevant (Nieveen & Folmer, 2013) to teachers' contextualised needs, as well as to my instructional ALT suggestions generated; and (2) If I covered Phase's 1 design proposal in a fair and comprehensive manner (Cohen et al., 2011; Nieveen & Folmer, 2013).

I secondly attempted to determine if the design components represented in my global design might be considered consistent. For this purpose, I compiled and screened three consistency checklists (Appendix B1-3). This, again, enabled me to:

- Compare each design component's interconnectedness (Van den Akker, 2013).
- Determine if my design components were consistent with future-orientated design guidelines (Carl, 2012; Ornstein & Hunkins, 2014).
- Determine if the construction of my content is an acceptable portrayal of its underlying theory and the participants' experiences (Cohen et al., 2007, 2011).

I thirdly and fourthly attempted to determine if the envisaged ER serious game represented in my global design might be considered practical and effective. For this purpose, I compiled and screened a practicality checklist (Appendix C) from the DR literature (Barab & Squire, 2004; Nieveen & Folmer, 2013; Plomp, 2013) and an effectiveness checklist (Appendix D) provided by Rowntree (as cited in Carl, 2012, p. 162). These checklists enabled me to determine if:

- The extent that my intended intervention is expected to be usable in the contextual setting for which it was developed (Nieveen & Folmer, 2013).
- The extent that my intended intervention is expected to result in the intended outcomes (Nieveen & Folmer, 2013).

Using the quality-orientated checklists (Appendix A-D), I identified five potential threats and subsequently attempted to incorporate mitigating steps to improve my global design, which I meticulously documented in my Field Notes (Appendix P). The potential threats identified as such primarily related to:

- The omission of relevant information such as the influence of external forces on the ER serious game being played in the actual setting (Cohen et al., 2011).
- The incorporation of the envisaged intervention into teachers' professional working hours.
- Potential cost, time and resource intensiveness (Carl, 2012; Ornstein & Hunkins, 2014).
- The limited range of information and skills being addressed (Carl, 2012; Ornstein & Hunkins, 2014).

In addition to mitigating steps to improve my global design for an ER serious game, I documented the perceived limitations and recommendations in my Field Notes (Appendix P) for consideration in a future second study.

## CHAPTER 3 CONJECTURAL SUBSTANTIVE HEURISTICS

### 3.1 INTRODUCTION

In this chapter, I introduce the conjectural substantive heuristics represented in Section 3.5, Figure 3.7. The focus of this chapter is on the development of my conjectural substantive heuristics, which were generated from the ALT, EI and ER literature. As such, understanding this chapter is dependent on the detail set out in Figure 3.7, which I cross-referenced based on its represented activities as ALT or EI, e.g. 5.

Prevailing local and international educational demands necessitate an emotionally intelligent workforce (Bichelmeyer et al., 2010; Maree & Mokhuane, 2007). Prominent contributors to the field of EI indicate that EI teachers tend to employ more appropriate strategies to deal with different work stressors (Brackett et al., 2010; Joseph & Newman, 2010). For example, teachers who are competent in EI are more likely to develop and foster supportive teacher-learner relationships, and demonstrate effective classroom management (Jennings & Greenberg, 2009). In turn, a healthy classroom climate is created, which contributes to learners' social, emotional and academic outcomes, as well as teachers' commitment (Jennings & Greenberg, 2009), efficiency (Perry & Ball, 2007) and job satisfaction (Brackett et al., 2010; Joseph & Newman, 2010). In contrast, the classroom climates established by EI incompetent teachers seem to result in emotionally burnt-out teachers either leaving the profession (Brackett et al., 2010; Jennings & Greenberg 2009; Joseph & Newman, 2010), or enforcing a hostile and rigid learning environment (Jennings & Greenberg, 2009).

Therefore, acknowledging the significance of South African teachers' EI as part of their professional development is imperative for an effective EI workforce (Brackett et al., 2013; Palmer & De Waal, 2011; Schutte et al., 2013). The professional development of teachers is currently dependent on the opportunities provided by the Department of Education's (DoE) *continued professional teacher development management system* launched in 2014 (Mpisi, 2017). Within this system, development opportunities focus largely on cognitive subject training rather than emotional and relational practice (Lubala, 2017; Mpisi, 2017). Equally, the DOE's educational action plan towards 2025 (DBE, 2011) for the most part "ignore[s] or underplay[s]" the emotional dimension of teachers' work (Palmer & De Waal, 2011, p. 171). In addition, teachers themselves report a lack of motivation, time and tools to deal with life-skill issues themselves (Maree & Mokhuane, 2007; Lubbe, 2012; Zeidner et al., 2002). Due to teachers' position in the context of their professional and personal lives (Merriam & Bierema, 2014), teachers as adult learners have distinct learning needs and interests that are different to those

of children (Knowles, 1980). As such, ignoring the emotional practices of teachers confirms a lack of consideration for the adult nature of the workforce. It also demonstrates a lack of recognition of their emotional development in a manner that would satisfy them as adults and professionals.

This therefore emphasises the need for structured and well-supported EI interventions for teachers as adult learners (Brackett et al., 2009). Training adults entails the act of coaching or accustoming them to a mode of behaviour or performance (The American Heritage Dictionary of the English Language, 2018). As such, an EI training intervention refers to an “act or process of intervening” by means of a “systematic process of assessment and planning employed to remediate or prevent” (The American Heritage Dictionary of the English Language, 2018) the educational problem of fostering teachers’ EI. Given the evidence that teachers’ EI contributes to professional efficiency and learner outcomes, it is concerning that training interventions explicitly aimed at teachers’ EI development are still scarce (Dolev & Lesham, 2017; Jennings & Greenberg, 2009). Research focusing on investigating EI training interventions for teachers seems to be equally lacking (Dolev & Lesham, 2017). An apparent lack of documented theoretical underpinnings of existing EI interventions only reinforces these concerns (Thory, 2013). For these reasons, it seemed important to address this need and to theoretically ground such intervention on sound Adult Learning Theory (ALT), as discussed further on.

As visualised in Figure 3.1, I relied on theoretical and practical sources of information to conceptually design the first prototype of my envisaged intervention. These sources involved (1) ALT’s instructional suggestions; (2) EI from a psychological perspective; narrowed down to (3) The Theory of ER; (4) The particular contextualised ER needs of the end user; and finally (5) Serious game design strategies.

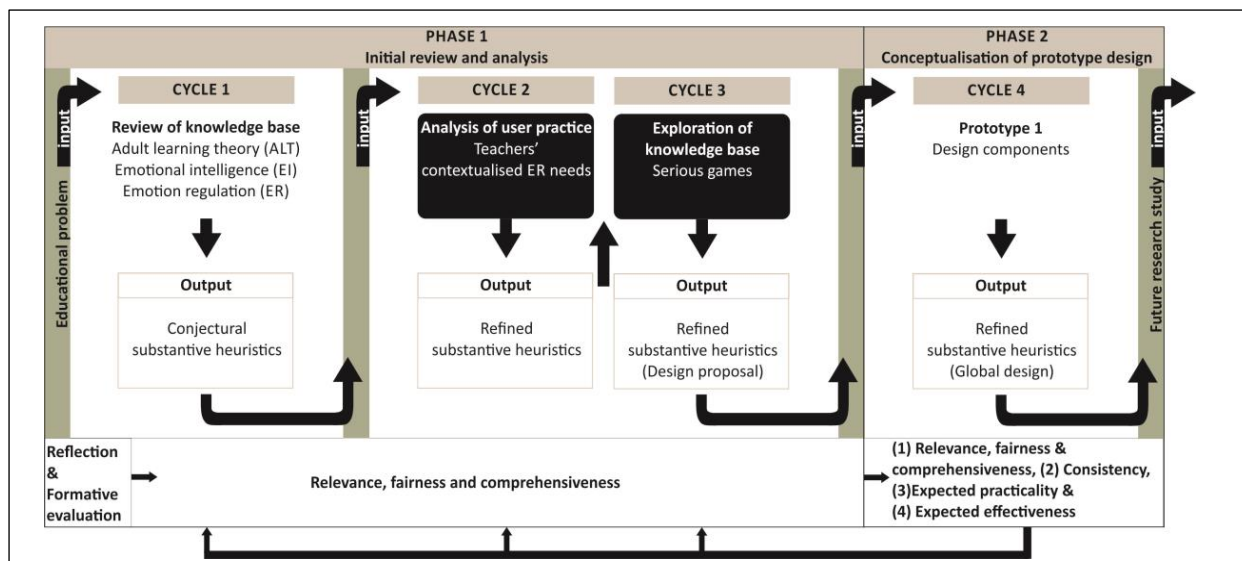


Figure 3.1: Procedural conceptual framework (adapted from Dowse & Howie, as cited in Plomp, 2013, p. 41)

This chapter constitutes Cycle 1 of the procedural framework. The focus of Cycle 1 was to generate a set of quality-orientated conjectural substantive heuristics from ALT, EI, and ER literature that might potentially ensure an effective intervention that contributes to teachers' EI. In this chapter, I firstly reviewed the instructional suggestions from the ALT literature as the theoretical foundation. These suggestions provided me pedagogical and practical insights into substantive heuristics that might increase the effectiveness of an intervention aimed at teachers, and on which I based the subsequent reviews and analysis. Guided by the instructional ALT suggestions, I secondly reviewed EI literature to ascertain what is known about current EI practices, in particular, I focused on the envisaged intervention's content, measurement and scoring. I illuminated factors deterring the use of existing EI practices relating to conflicting EI theories, as well as existing measurement and scoring methods. In order to potentially alleviate some of the EI limitations, I identified suggestions from EI contributors' that I found relevant to the ALT suggestions. One alleviating EI suggestion prompted the third review, constituting a particular ER theory and related research. I finally used the ALT suggestions, the alleviating EI suggestions, and ER literature to formulate my conjectures. I discuss the last two sources of information that comprise Cycles 2 and 3 in Chapter 4. In this chapter, constituting Cycle 1, I contributed to quality-orientated outputs by employing activities related to particular a quality criterion (Sub-section 2.5.4, Chapter 2).



### 3.2 QUALITY-ORIENTATED ACTIVITIES AND CRITERIA

To guide the quality of my evolving intervention and to generate improvements (Thijs & Van den Akker, 2009), I conducted two quality-orientated activities during and after Cycle 1, as visualised in Figure 3.2.

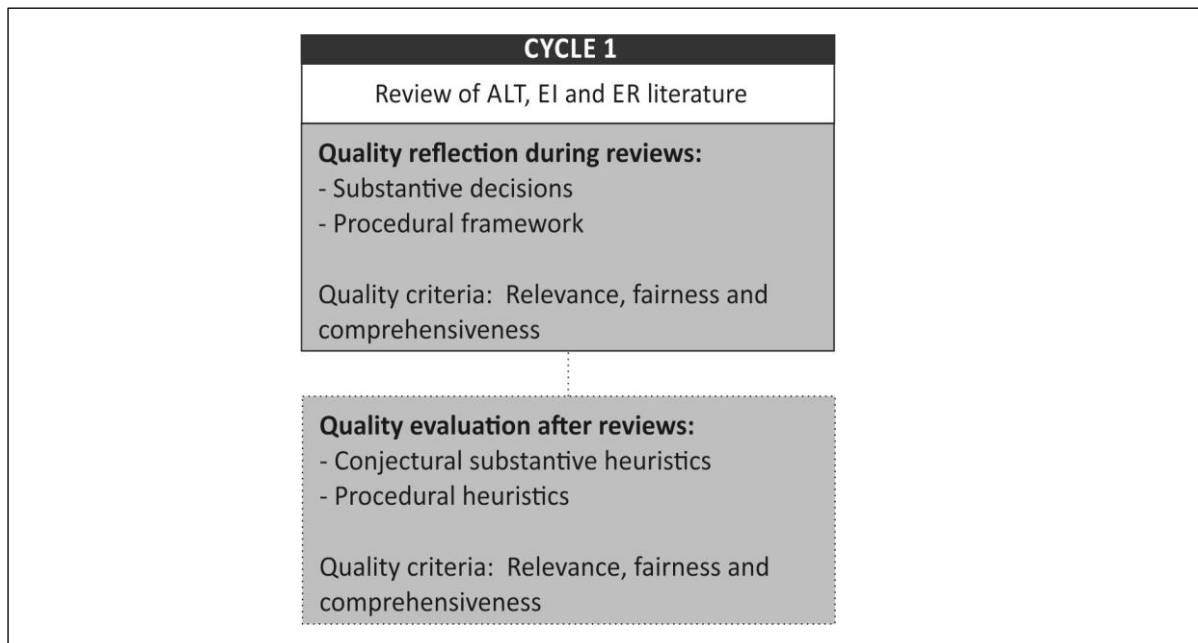


Figure 3.2: Quality-orientated activities conducted during and after Cycle 1

The *first* quality-orientated activity that I conducted was to continuously reflect on the relevance, fairness and comprehensiveness of my conjectural substantive decisions during the ALT, EI and ER reviews. I describe these quality reflections in this chapter. This meant that I aimed to determine if my decisions might be a relevant contribution to the existing EI practices of teachers (Nieveen & Folmer, 2013; Plomp, 2013). In particular, I aimed to determine:

1. If my decisions were relevant to teachers' contextualised needs, as well as to the ALT suggestions generated.
2. If I covered state-of-the-art information from the ALT, EI and ER literature in a fair and comprehensive manner.

In this way, I attempted to define clear and appropriate conjectural substantive heuristics (Section 3.5) from the ALT, EI and ER literature to be embedded in the first prototype. I furthermore determined if my procedural framework needed to be modified or improved to accommodate the substantive decisions reflected on during these reviews.

The *second* quality-orientated activity that I conducted, and described in Chapter 2, was to formatively evaluate the relevance, fairness and comprehensiveness of the conjectural substantive and procedural heuristics after Cycle 1's ALT, EI and ER reviews. For this purpose, I conducted a screening checklist that focused on the quality criteria of relevance, fairness and comprehensiveness (Appendix A). This entailed checking off important component characteristics of the evolving intervention (Nieveen & Folmer, 2013). In an effort to account for typical and non-typical DR-specific threats (McKenney et al., 2006) to the heuristics' quality, I compiled a checklist from existing educational research (e.g. Cohen et al., 2011) and DR literature (e.g. Plomp, 2013).

I theoretically grounded the conjectural and evolving substantive heuristics in ALT. This decision ensured that I acknowledged the teachers' distinct attributes and needs as adult learners who require a unique learning approach (Beavers, 2009).

### **3.3 REVIEW OF THE ALT LITERATURE**

The purpose of this review was to generate a set of adult learning instructional suggestions for an effective intervention for teachers. I also aimed for this review to form the basis of the conjectural substantive heuristics informing all subsequent reviews and analysis. This means that the theoretical foundation provided by ALT influenced all the decisions taken in terms of the envisaged intervention.

To guide the quality of the ALT review, I selected instructional suggestions that are relevant to teachers' professional development. I furthermore aimed to cover state-of-the-art information from the ALT literature in a fair and comprehensive manner by integrating and representing major ALTs in the instructional suggestions generated. In this way, I attempted to generate clear and appropriate ALT suggestions as the basis of the conjectural substantive heuristics.

ALT is a learning approach to understanding and planning instruction for adult learners (Merriam & Bierema, 2014). Learning theories such as humanism and constructivism, which are foundational to our understanding of adult learning, are traditional theories embedded in ALT. As the nature of adult learning is complex, personal and context-bound, there is no single all-encompassing adult learning or traditional theory that can explain adult learning (Merriam & Bierema, 2014).

Three major ALTs include andragogy, self-directed learning, and transformational learning; while experiential learning can be viewed as central to all three major ALTs (Merriam & Bierema, 2014). Andragogy Theory, first promoted by Knowles (1968), seeks to identify how to

facilitate learning in adults as differentiated from pedagogy, which focuses on teaching children. Self-directed learning, first promoted by Houle (1961) and Tough (1967), is about learners taking control of their own learning, therefore deciding what and how to learn. Transformational learning, which was promoted by authors such as Mezirow (1978), is about changes in how you perceive yourself and your place in the broader social context through critical reflection. Experiential learning, which has been promoted by authors such as Kolb (1984), involves learner-centred and self-directed learning from authentic tasks. This entails learning from experiences, and subsequently one's failures (Reigeluth & Carr-Chellman, 2010a, 2010b; Merriam & Bierema, 2014).

Embedded predominantly in humanism and constructivism, proponents of these ALTs place the learner and their personal growth and fulfilment at the centre of the learning process (Merriam & Bierema, 2014). These proponents (Edgar, 2012; Merriam & Bierema, 2014; Ornstein & Hunkins, 2014) furthermore focus on how learners construct knowledge and make meaning of their experiences as shaped by their socio-cultural context. The envisaged intervention concurs that EI training interventions should ideally be grounded in learner-centred, socio-constructivist, and experiential learning strategies (Reigeluth & Carr-Chellman, 2010a, 2010b; Bichelmeyer et al., 2010; Ciarrochi & Mayer, 2013; Sparrow & Knight, 2006).

To guide the quality of this review and to generate a relevant, fair and comprehensive set of ALT suggestions, I found it advantageous to consider instructional suggestions representing a combination of ALTs. For this purpose, I decided to focus on Andragogy Theory (Knowles, 1998), comprising six adult learning assumptions that can be used to coherently combine major ALTs (Merriam & Bierema, 2014). These assumptions involve adult learners' self-concept, experiences, readiness to learn, immediate problem-centred orientation, internal motivation, and need to know. According to Knowles (1990, pp. 57-63), andragogic assumptions provide a model of learning that identifies the characteristics of adult learners (Merriam & Bierema, 2014). This can be used to guide and improve their teaching practice (Beavers, 2009).

### **3.3.1 Andragogic assumptions**

Apart from coherently combining major ALTs, Andragogy Theory furthermore focuses on lessons drawn from application to practice (Knowles, 1990) and provides for flexible application in own practice (Merriam & Bierema, 2014). This means that I was able to apply instructional suggestions relevant to teachers' professional development. In addition, integrating major ALTs within andragogic assumptions ensured that I could potentially combat

Andragogy Theory's main criticism. This entails its seeming lack of consideration for socio-cultural influences on learning (Pratt & Sandlin, as cited in Merriam & Bierema, 2014).

In this sub-section, I describe each andragogic assumption in convergence with the associated ALTs. Based on instructional suggestions from ALT authors (e.g. Merriam & Bierema, 2014) regarding each assumption, I furthermore specify practical implications that I found to be relevant to teachers' professional development. As such, I describe instructional suggestions in an integrative manner based on the assumptions provided within Knowles's Andragogy Theory. I finally consolidate the various ALT suggestions within the conjectural substantive heuristics presented in Section 3.5 (Figure 3.7, ALT).

### **Assumption 1: Adult learners' self-concept**

This assumption entails that a maturing person develops an independent self-concept that favours self-directed learning, as opposed to a dependence on being given learning directions (Knowles, 1990). This assumption converges with self-directed learning. Knowles (1975, p. 18) defines self-directed learning as:

*A process in which individuals take the initiative, with or without the help of others, in diagnosing their (own) learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes.*

Self-directed learning takes place due to personal inquiry within adults' everyday life (Merriam, 2001), and therefore requires that adult learners' autonomy should be respected (Knowles, 1990). Adult learners resist learning when their independence is being restricted through the application of strategies designed for children (Merriam & Bierema, 2014), or when the direction of learning is in conflict with where they believe it should go (Beavers, 2009; Little, 1987). Apart from promoting individual learning, self-directed learning also promotes taking advantage of individuals' willingness to test or confirm their learning (Merriam & Bierema, 2014).

As such, the key to designing training material aimed at promoting self-directed learning in various learning environments, including teachers' professional development, could entail two general suggestions: (1) Active learner involvement in or control over their own learning (Beavers, 2009; Conti, 1989; Knowles, 1990; Little, 1987; Merriam & Bierema, 2014; Trotter, 2006); and which is (2) Part of a collaborative effort (Brockett, 1994; Conti, 1989; Knowles, 1975; Merriam & Bierema, 2014). The first suggestion seems to imply teachers planning the direction (Trotter, 2006) of what and how they should learn (Merriam & Bierema, 2014). This

could entail teachers selecting their own objectives and content (Little, 1987) (ALT 3). The suggestion furthermore implies valuing teachers' judgement in assessing their own learning through questions such as "What is not going well?" (Costa & Kallick, as cited in Merriam & Bierema, 2014, p. 75) (ALT 8 & 9). The second suggestion seems to imply creating a collaborative atmosphere characterised by mutual respect, trust and appreciation (Beavers, 2009; Merriam & Bierema, 2014) between teachers sharing questions, insights and reflections (Brockett, 1994) (ALT 12.2).

However, not all adult learners or situations favour self-directed learning (Merriam & Bierema, 2014). For instance, this may comprise adult learners lacking the willingness or life circumstances to be self-directed learners (Beavers, 2009; Merriam & Bierema, 2014), or situations presenting new areas of learning that might necessitate facilitator dependence (Knowles, 1980). Therefore, designing and developing instructional material for adults demands that the designer customises learning based on a determination of each teacher's self-directed learning needs (Knowles, 1975) (ALT 10 & 13).

## **Assumption 2: Adult learners' experiences**

This assumption entails that adult learners accumulate a reservoir of life experiences that are rich sources of learning (Knowles, 1990). Adult learners' experiences are both resources and stimuli for learning. This means that adult learners learn from prior experiences, but that ongoing experiences often require new learning. Practically, this entails that adult learners' prior experiences must be respected and employed as learning opportunities (Little, 1987; Trotter, 2006), while training strategies creating new or building on prior experiences should be considered (Merriam & Bierema, 2014).

By ignoring adult learners' experiences, we threaten their independent self-concept, the first andragogic assumption (Knowles, 1990; Merriam & Bierema, 2014). This connection between life experiences and learning is central to all major ALTs (Corno & Randi, 2013; Merriam & Bierema, 2014). As such, this assumption converges with self-directed learning, and in particular, transformation learning as our experiences change and influence the way in which we perceive ourselves and our contexts (Brockett, 1994; Corley, 2008). Experiential learning, as first modelled by Kolb (1984), is an experiential learning cycle that encapsulates the central ideas about experiences and learning found in major ALTs. For this reason, I incorporated and herewith describe the second andragogic assumption in convergence with transformational learning linked to each stage of Kolb's (1984) Experiential Learning Cycle.

Kolb's (1984) experiential cycle recognises experiences as both resources for learning, and stimuli for continuous learning. As visualised in Figure 3.3, Kolb's (1984) experiential learning cycle indicates how knowledge is successfully created and re-created through the transformation of experience (Kolb, 1984; Kolb et al., 2000).

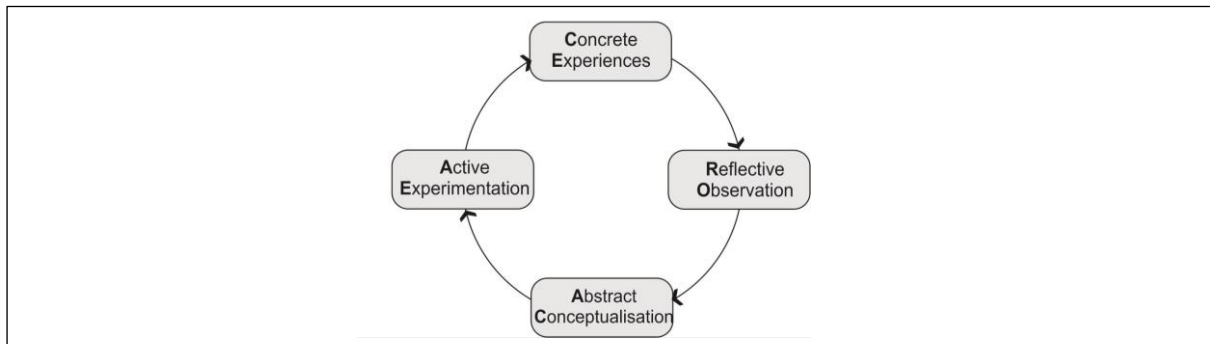


Figure 3.3: Experiential learning cycle (Kolb et al., 2000, p. 39)

Kolb's (1984) Experiential Learning Cycle consists of four stages. While Concrete Experiences and Abstract Conceptualisation represent grasping experiences, Reflective Observation and Active Experimentation represent transforming experiences. The four stages entail Concrete Experiences (CE) as the basis of Reflection and Observation (RO) from which conclusions are drawn, generalisations are made, and hypotheses are formed (AC). The implications thereof can then be tested through Active Experimentation (AE) in new Concrete Experiences (CE) (Kolb, 1984; Kolb et al., 2000). Although Kolb's (1984) experiential model represents a sequential and continuous cycle of learning, successful learning is likely to occur if learners apply each stage, regardless of the order in which it is applied (Dyke, 2006).

**Concrete Experiences** as a stage of learning involves learners' ability to engage with new experiences openly and without bias (Kolb, 1984). The key to promoting Concrete Experiences in various learning environments, including teachers' professional development, could entail two general suggestions: (1) Employing learners' prior experiences as learning opportunities (Little, 1987; Trotter, 2006); and (2) Immersing learners into situations that provide contextualised learning experiences (Merriam & Bierema, 2014).

The first suggestion seems to imply gathering information concerning teachers' past experiences to be used as a starting point for learning (Merriam & Bierema, 2014) (ALT 1). The second suggestion seems to imply immersing teachers in field experiences, problem-based learning exercises, role-playing exercises, and a simulation or game that exposes them to authentic EI experiences within their real-life contextual setting (Merriam & Bierema, 2014) (ALT 5). This second suggestion entails that the intervention design should reflect the learning strategy I intend to apply (ALT 2). This second suggestion concurs with contextual learning, which

acknowledges the role that socio-cultural values play in authentic learning contexts. This means employing contextual learning acknowledges, for example, that an older teacher will not necessarily ask for help from a younger, less experienced teacher (Merriam & Bierema, 2014).

**Reflective Observation** as a stage of learning involves learners' ability to observe and reflect on their experiences from several perspectives (Kolb, 1984). The key to promoting Reflective Observation in various learning environments, including teachers' professional development, could entail the general suggestion to employ strategies that enhance learners' propensity for critical reflection (Merriam & Bierema, 2014). This refers to strategies that assist or guide learners in the process of questioning, evaluating and critiquing (Merriam & Bierema, 2014) what they do in practice and why, as well as what works and why (Brookfield, 1990).

This suggestion seems to imply the employment of one or more critical reflection strategies in my envisaged intervention. The most favourable strategy seemed to entail the creation of a collaborative environment allowing for optimal critical reflection on own and other's practices and perspectives (ALT 12.2). This entails the creation of a trusting, supportive and accepting community environment that encourages self-exploration and self-expression (Beavers, 2009; King, 2004; Little, 1987; Merriam & Bierema, 2014) (ALT 12.2). This furthermore entails collaboration between teachers with similar EI experiences, but different EI experience-levels (Beavers, 2009; Mezirow, 2000) (ALT 12.2). This could finally entail collaborative opportunities for story-sharing, dialogue, peer-learning (Merriam & Bierema, 2014) and brainstorming continuing beyond the intervention's completion (Beavers, 2009) (ALT 12.2).

Another favourable strategy seems to entail technology-assisted teacher reflection (Merriam & Bierema, 2014). Technology-assisted learning refers to the application of technology, such as a cell-phone application in some component(s) of the learning process. This is in contrast with technology-based learning that is completely digital based, and which seems less effective (Capozzi, 2000) than a hybrid form of digital and analogue learning (Merriam & Bierema, 2014). Technology-assisted teacher reflection could entail online learning communities (Wenger & Snyder, 2000) of teachers engaging in collaborative reflection (Merriam & Bierema, 2014) about EI practices (ALT 12.2). In addition, individual reflection could be enhanced by providing technology-assisted learner analytics (ALT 12.1). This means that technology is used to automatically provide data related to a teacher's performance and progress in the intervention (ALT 12.1). As such, teachers can reflect on their own EI performance and progress in real time, which also allows for immediate adjustments to their learning (ALT 12.1) (Merriam & Bierema, 2014). Practically, this means that individual teachers' EI strength and weaknesses can be used

to continuously customise the training to their individual needs (Schutte et al., 2013; Sparrow & Knight, 2006; Zeidner et al., 2002) (ALT 12.1).

**Abstract Conceptualisation** as a stage of learning involves learners' ability to create concepts that integrate their observations and reflections into logical and sound theories (Kolb, 1984), guiding their subsequent decisions. The key to promoting Abstract Conceptualisation in various learning environments, including teachers' professional development, could entail two general suggestions: (1) Assessing learners' espoused theories versus learners' theories-in-use (Argyris & Schön, 1974); and if needed based on the assessment results (2) The provision of guidance with critical reflection (Beavers, 2009).

The first suggestion seems to imply incorporating an assessment method that might determine if teachers' own beliefs about their EI practices (espoused theory) are similar to their actual EI practices (theories-in-use) (Argyris & Schön, 1974; Merriam & Bierema, 2014) (ALT 11). This would indicate if teachers' critical reflection amounted to learning, meaning that teachers would try something similar or different when faced with new experiences. The second suggestion seems to imply the provision of guidance by the facilitator if a teacher's critical reflection (Beavers, 2009) amounts to an espoused theory of his or her own EI practices (ALT 13).

**Active Experimentation** as a stage of learning involves learners' ability to use the theories created during Abstract Conceptualisation to make decisions. This allows learners to competently solve problems encountered in new Concrete Experiences (Kolb, 1984) (ALT 7). The key to promoting Active Experimentation in various learning environments, including teachers' professional development, could entail the general suggestion to create an environment that allows for experimentation and risk-taking (Beavers, 2009; King, 2004) when faced with similar or novel Concrete Experiences. This could imply creating an understanding and supportive environment (Beavers, 2009; Merriam & Bierema, 2014) where such behaviour is promoted (ALT 6).

Competently solving additional problems presented in the form of new Concrete Experiences implies that learners successfully attain the experiential and transformational learning required (Merriam & Bierema, 2014). This means that a shift occurred about previous beliefs and assumptions about the self and the world (Mezirow, 2000) (ALT 11). Experientially, this means a progress in competence as teachers continuously reflect, conceptualise and experiment (Kolb, 1984). Assessing teachers' competence in dealing with new EI problem situations could therefore be an indication of learning attainment (ALT 11), as well as an indication of the effectiveness of the intervention (ALT 12.1).



### **Assumption 3: Adult learners' readiness to learn**

This assumption entails that adult learners' readiness to learn is linked to the developmental tasks of their social roles (Knowles, 1990). An example of this is a mother having to learn how to raise a child or a teacher having to learn how to deal with disruptive learners. This means that multiple and changing social roles of adulthood create a continuous need for learning (Merriam & Bierema, 2014). Knowles (1980, p. 51) calls this the "teachable moment(s)". In a training environment, such moments could entail either an immediate need or a need created by preparing for a future role (Merriam & Bierema, 2014). This assumption also provides resources used for learning.

The key to promoting a readiness to learn in various learning environments, including teachers' professional development, could entail the suggestion to employ experiential instructional techniques (Knowles, 1975; Merriam & Bierema, 2014). This seems to imply exposing teachers to emotional problem situations that necessitate EI behaviour, or that create a real-life stimulus (Merriam & Bierema, 2014) for learning about their EI practices (ALT 5). Moreover, the purpose and benefit of learning about EI should be presented in a clear and concrete manner (Beavers, 2009) (ALT 5).

### **Assumption 4: Adult learners' immediate problem-centred orientation**

This assumption entails changes in a maturing person's time perspective regarding when and why to apply their learning. This involves a changing perspective from future application of learning to immediate application of learning in order to solve a particular problem at hand (Knowles, 1990). This assumption logically relates to all previous assumptions in providing learning through problem-solving, often in a self-directed manner.

The key to promoting an immediate problem-solving orientation could be the general suggestion of problem-based learning with immediate application in practice (Beavers, 2009; Merriam & Bierema, 2014). This suggestion seems to imply the creation of authentic EI problems that need to be solved within the real contextual setting (Merriam & Bierema, 2014) (ALT 5). In-service training furthermore provides opportunities for immediate application of learning such as solving a classroom management problem when it occurs (ALT 7).

### **Assumption 5: Adult learners' internal motivation**

This assumption entails that adults are mostly motivated internally rather than externally (Knowles, 1990). On the one hand, internal or intrinsic motivation entails an internal drive to accomplish something, and is grounded in challenge, mastery and curiosity (Merriam &

Bierema, 2014). External or extrinsic motivation, on the other hand, entails being externally driven to accomplish something. This assumption logically relates to all previous assumptions, as self-directed learning, prior experiences, development tasks based on social roles, and immediate problem-solving exemplifies internal forces motivating us to learn.

Most professional development learning required by teachers is externally driven, and not all teachers can be expected to be internally motivated for each training event planned. Beavers (2009) indicates that these circumstances might benefit from the inclusion of external incentives. However, Merriam and Bierema (2014) point out that internal motivation can be encouraged even in such circumstances. Pink (2009) argues that internal motivation is enhanced in the presence of autonomy, mastery and purpose. Adult learners' autonomy refers to their self-directedness, which is the first andragogic assumption. Mastery refers to the drive to improve and progress in things that matter, while purpose refers to working toward something bigger, relevant and important to us.

As such, the key to promoting internal motivation in various learning environments could be the general suggestion to enhance a sense of autonomy, mastery and purpose. This further seems to imply that the intervention's content, goals and objectives should be significant, realistic and immediately useful (Little, 1987; Pink, 2009) to teachers; as well as relevant (Brookfield, 1990; Little, 1987; Merriam & Bierema, 2014; Pink, 2009) to their contextualised needs. This could entail an investigation into teachers contextualised EI needs for incorporation into the experiential stages envisaged (ALT 1). This could furthermore entail that teachers evaluate if the envisaged intervention is likely to prescribe to these requirements (ALT 4).

#### **Assumption 6: Adult learners' need to know**

This assumption entails that adults need to know the reason why they are learning something (Knowles, 1990). This assumption logically relates to all previous assumptions, in particular Assumption 5, as adult learners' internal motivation to learn is enhanced when they believe there is a need to learn something. Apart from enhancing the intrinsic motivation already discussed, this suggestion seems to imply presenting real or simulated EI experiences in which teachers realise that there is a gap between their existing EI competency and how competent they want to be (Merriam & Bierema, 2014) (ALT 5).

The six andragogic assumptions and instructional suggestions discussed form the basis of the conjectural substantive heuristics in this study. I consolidated the various ALT suggestions in Figure 3.7 (ALTs). This allowed me to ground all subsequent reviews and analysis, and the conceptual design of my envisaged intervention on sound ALT suggestions.

### **3.4 REVIEW OF THE EI LITERATURE**

The purpose of this review was to update the conjectural substantive heuristics for an effective intervention that might potentially contribute to teachers' EI. Guided by the ALT suggestions, I reviewed the EI literature to ascertain what is known about current EI practices. I focused, in particular, on my envisaged intervention's potential content, measurement and scoring. For this reason, the review comprised EI theory, and existing measurement and scoring practices. This led me to consider three salient EI limitations and alleviating suggestions from prominent EI contributors. In Figure 3.4, I provide a visual summary of the process that I followed during this review.

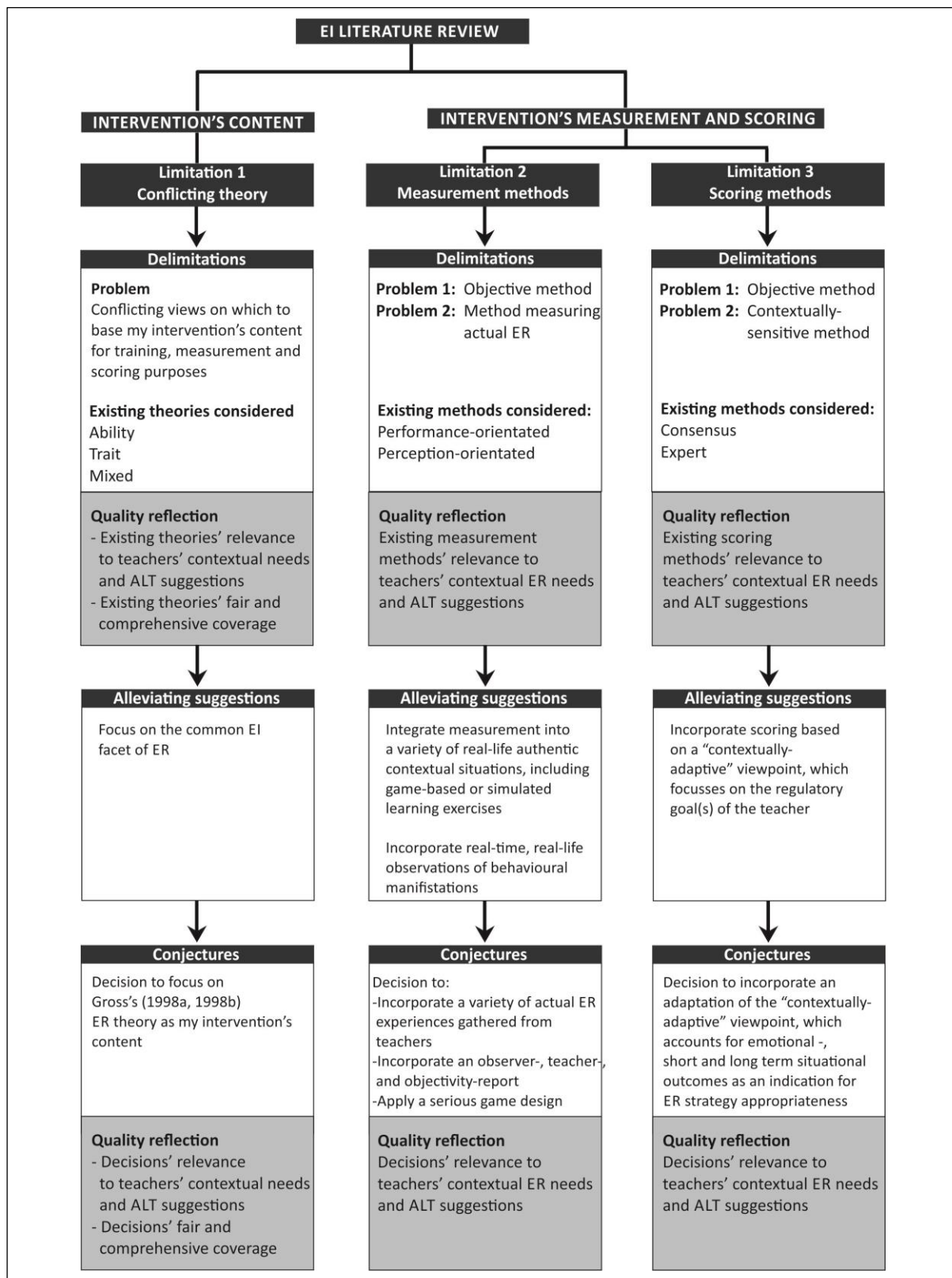


Figure 3.4: Summary of the EI literature review process followed

As summarised in Figure 3.4, the process followed in this literature review was to:

- Illuminate EI limitations deterring the use of existing EI practices in my envisaged intervention's content, measurement and scoring. This entailed three salient EI limitations that were the most often discussed by contributors in the existing EI

literature. These constituted: (1) Conflicting theories, (2) Measurement methods, and (3) Scoring methods<sup>1</sup>.

- Identify alleviating suggestions from the EI contributors.
- Formulate conjectures that define clear and appropriate substantive heuristics to be embedded in my envisaged intervention. This assisted me to generate Cycle 1's quality-orientated output guiding Cycles 2-4 of the procedural framework.

Scientific EI literature has, in recent times, proliferated from the field of psychology into mainstream press and academic business literature since 1995 (Carson et al., 2016). Although the term 'emotional intelligence' is predominantly used in the literature, some EI authors additionally refer to terms such as 'emotional literacy' (Steiner, 1984), 'emotional competence' (Boyatzis, 2009), and 'emotional and social intelligence' (Bar-On, 2012). I used the term 'emotional intelligence' as it provides for a collective understanding amongst EI researchers. Commencing with my envisaged intervention's content, I subsequently discuss the three salient EI limitations.

### **3.4.1 Content of the envisaged intervention**

This study's training, measurement and scoring design was based on EI theory. As such, I herewith discuss the salient limitations of conflicting EI theories, the associated delimitations, alleviating suggestions, and my conjectural decisions in more detail. In this study, EI limitations refer to existing EI practices' restrictions. EI delimitations<sup>2</sup> and alleviating suggestions refer to those EI restrictions and suggestions that I found relevant.

#### *3.4.1.1 Limitation 1: Conflicting theory*

In 1990, Salovey and Mayer developed the first documented theory of EI, proposing that cognition and emotion are interconnected as distinct mental abilities (Salovey & Mayer, 1990). Since then, several theories have emerged with conflicting theories of EI, (Matthews et al., 2004). Although such conflicting views expand EI research, Cherniss (2010a) argues that a lack of conceptual consensus hampers scientific progress in the field of EI, and might result in the concept of EI being perceived as insignificant.

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<sup>1</sup> In the EI literature review, measurement and scoring methods refer to the design components of assessment or evaluation. In this study, assessment entails the methods selected to measure and score teachers' learning during or after the intervention, whereas evaluation entails the methods selected to measure and score the effectiveness of the intervention.

<sup>2</sup> Delimitations arise from limitations, and define the boundary set by consciously including and excluding certain characteristics (Simon & Goes, 2013).

In order to understand the contradictions and confusion found amongst EI contributors with conflicting EI theories (Humphrey et al., 2007), it is necessary to look at how the concept of EI originated. Historically, the general construct of EI is founded in the work by scholars such as Darwin, Dewey, Thorndike, Doll, and developed by Gardner in the 1900s (Bar-On, 2012; Joseph & Newman, 2010). Scientific references to EI appeared during the 1960s (Mayer et al., 2008), while the term 'emotional intelligence' was coined in the seminal work of Salovey and Mayer in 1990 (Joseph & Newman, 2010). During the late 1990s, Daniel Goleman commercially popularised the term by claiming that EI matters more than the intelligence quotient (IQ) in predicting life outcomes such as work success and general well-being (Mayer et al., 2008). This resulted in a rapid increase in EI research within various disciplines, including education (Brackett et al., 2010). The increase in EI research furthermore brought about the emergence of several EI theories represented in conceptual models providing rich, yet seemingly conflicting understandings of EI (Fiori et al. 2014; Gardner & Qualter, 2010; Mayer et al., 2008). As such, conceptual exclusiveness rendered a conclusive consensus on a conceptualisation of EI problematic, resulting in a number of delimitations.

#### *3.4.1.2 Delimitations*

EI theory represents the content on which my EI intervention's training, measurement and scoring design is based. Knowing which EI theory provides a true reflection of the EI construct therefore becomes problematic on the basis of current conflicting views. In order to elucidate the significance of the problem, I provide an overview of three groups of existing EI theories and their respective conceptual models.

Distinct classification systems (e.g. Cherniss, 2010a; Gignac, 2010; Joseph & Newman, 2010) have been proposed to structure the complex and conflicting theories of EI (Cherniss, 2010a). A commonly used classification system found in EI literature (Austin, 2010; Brackett et al., 2013; Fiori et al., 2014; Petrides, 2010) is that of grouping 'ability', 'trait' and 'mixed' theories and their respective conceptual models of EI.

The abilities and personality traits constituting each model's conceptual understanding are furthermore represented by particular EI facets (Humphrey et al., 2007; Joseph & Newman, 2010; Petrides, 2010), also known as sub-scales (Bar-On, 2012; Mayer et al., 2004) or components (Schutte et al., 1998) within EI literature. These facets constitute each model developer(s)' conceptual explanation of EI (Austin, 2010; Brackett et al., 2013; Fiori et al., 2014). In order to critically expand on each EI grouping's conceptual explanation, in Table 3.1 I provide

a summary of the conceptual facets found amongst the three dominant (Cherniss, 2010a) ability, trait and mixed EI models.

Table 3.1: Summary of three EI models' conceptual facets

<b>EI models</b>	<b>Ability</b> (Mayer et al., 2004)	<b>Trait</b> (Petrides, 2010)	<b>Mixed</b> (Bar-On, 2010)
<b>EI Facets</b>	<ul style="list-style-type: none"> <li>▪ Perception of emotion.</li> <li>▪ Use of emotion to facilitate thinking.</li> <li>▪ Understanding of emotion.</li> <li>▪ Management of emotion (self-management and relation management).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Adaptability.</li> <li>▪ Assertiveness.</li> <li>▪ Emotion expression.</li> <li>▪ Emotion management (others).</li> <li>▪ Emotion perception (self and others).</li> <li>▪ Emotion regulation.</li> <li>▪ Impulsiveness (low).</li> <li>▪ Relationships.</li> <li>▪ Self-esteem.</li> <li>▪ Self-motivation.</li> <li>▪ Social awareness.</li> <li>▪ Stress management.</li> <li>▪ Trait empathy.</li> <li>▪ Trait happiness.</li> <li>▪ Trait optimism.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Self-perception - consisting of self-regard, emotional self-awareness, and self-actualisation.</li> <li>▪ Interpersonal - consisting of empathy, social responsibility, and interpersonal relationships.</li> <li>▪ Self-expression - consisting of emotional expression, assertiveness and independence.</li> <li>▪ Stress management - consisting of stress tolerance, flexibility and optimism.</li> <li>▪ Decision making - consisting of problem solving, reality testing and impulse control.</li> </ul>

As reflected in Table 3.1, ability models include ability facets such as an understanding of emotions (Mayer et al., 2004), whereas trait models include personality trait facets such as optimism and low impulsiveness (Petrides, 2010). Mixed models encompass both ability and trait EI facets (Boyatzis, 2009). Although common facets such as emotion management are found amongst disparate EI models, the distinction between ability, trait and mixed facets constitute each model developer(s)' conceptual explanation of EI (Austin, 2010; Brackett et al., 2013; Fiori et al., 2014).

Commencing with ability models, I herewith critically expand on each EI grouping's conceptual explanation. In order to consider particular alleviating suggestions and to guide my conjectural decisions, I thereafter reflect on the relevance, fairness and comprehensiveness of each EI grouping.

### ***Ability models***

The proponents of ability models (see MacCann & Roberts, 2008; Mayer et al., 2004) generally consider EI as cognitive-emotional abilities related to emotion-processing skills or the processing of emotional stimuli. They consider these cognitive-emotional abilities distinct from visual, verbal, or auditory stimuli and personality traits (Austin, 2010; Brackett et al., 2013; MacCann & Roberts, 2008; Pérez et al., 2005). The ability facets represented and measured by

ability EI models therefore reflect the conceptual understanding of EI from an ability viewpoint. Reflecting the ability facets summarised in Table 3.1, Mayer et al. (2004, 9. 197) define EI as:

*The capacity to reason about emotions, and of emotions to enhance thinking. It includes the abilities to accurately perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge, and to reflectively regulate emotions so as to promote emotional and intellectual growth.*

The proponents of ability models assume that an individual uses reasoning and problem-solving skills within an emotional environment to facilitate and optimise cognition (Austin, 2010; Brackett et al., 2013). The original ability model, developed by Mayer, Salovey and Caruso, has been used as the theoretical foundation for many successive ability models (Cherniss, 2010b; Mikolajczak, 2009; Ybarra et al., 2014). The original ability model was partly based on literature asserting that cognitive intelligence tests account for only a portion of work, school and life outcomes (Cherniss, 2010a; Gignac, 2010; Pérez et al., 2005). As such, the proponents of ability models present EI as a unique form of intelligence or mental ability that is not currently being measured by standard cognitive intelligence tests (Austin, 2010; Mayer & Salovey, 1997; Mikolajczak, 2009).

### ***Trait models***

The proponents of trait models (e.g. Petrides, 2010) generally consider EI as personality traits, also referred to as dispositional tendencies. As such, they consider EI as emotion-related traits of personality as opposed to cognitive-emotional abilities (Fiori et al., 2014; Pérez et al., 2005; Petrides, 2010). Reflecting the trait facets summarised in Table 3.1, Petrides (2010, p. 137) defines EI as “a constellation of emotional self-perceptions located at the lower levels of personality hierarchies.”

The most dominant (Cherniss, 2010a) trait EI model, the Petrides, Pita and Kokkinaki model, is considered as a second-generation model (Petrides, 2010). Its theoretical basis was established in 2001 by combining 15 facets through a content analysis of earlier EI models, including the original version of the Mayer, Salovey and Caruso ability EI model (Cherniss, 2010a; Mayer et al., 2004). Although such a combination includes ability and trait related facets, Petrides (2010) believes that EI specifically constitutes personality facets linked to the affective domain, rather than the cognitive domain of rational mental abilities. This means that trait EI is a relatively new way of considering the affective domain described by scholars such as Krathwohl et al. (1973) (Rodeiro et al., 2009). As a result, a high score on trait EI might portray an individual’s tendency to be confident, driven, and reflective (Brackett et al., 2013).



### ***Mixed models***

The proponents of mixed models (see Bar-On, 2010; Boyatzis, 2009; Goleman, 1995) generally consider EI as encompassing both ability and personality traits. As such, they primarily view EI as a broad range of mental abilities, such as emotional management, as well as traditional personality traits and dispositions such as empathy and motivation (Mikolajczak, 2009). The mixed facets represented and measured by mixed EI models therefore reflect a broad conceptual understanding of EI from both an ability and trait viewpoint. Reflecting the mixed facets summarised in Table 3.1, Boyatzis (2009, p. 757) defines EI as “an ability to recognize, understand, and uses emotional information about oneself that leads to or causes effective or superior performance.” Boyatzis (2009) indicates that the Boyatzis and Goleman model provides a behavioural and functional approach to emotional, social and cognitive intelligence within the holistic theory of personality through an emphasis on emotional competence (Boyatzis, 2009). As such, the proponents of mixed models view EI beyond the core construct of ability, including psychological facets such as personality and motivation (Kotzé & Venter, 2011; Webb et al. 2013).

### ***Quality reflection***

As I reflected on the quality criteria of relevance, fairness and comprehensiveness during Phase 1 (refer to Sub-section 2.5.4, Chapter 2), the decision as to which EI conceptualisation to apply as the content of my intervention needed to provide a relevant contribution to existing EI practices (Nieveen & Folmer, 2013; Plomp, 2013). As such, I reflected on the relevance of these EI conceptualisations in relation to teachers’ contextualised needs, as well as to the ALT suggestions generated. I furthermore reflected on each EI conceptualisation’s coverage of state-of-the-art information from EI literature in a fair and comprehensive manner. In the interests of documenting and reflecting on each decision taken, in the paragraphs below I go into detail regarding the conceptualisations that I considered but found to be inappropriate for the purposes of this intervention.

If I had decided to apply an ability, trait or mixed EI conceptualisation as the content for my envisaged intervention, such a conceptualisation might have had relevance to *teachers’ contextualised EI needs*. One might argue that applying any of the EI facets is likely to equip teachers to some degree emotionally, but only if the remaining design components are applied effectively.

However, if I had decided to apply either an ability or trait EI conceptualisation, such a decision might have seemed reductionist in nature, as it does not provide a true reflection of the more

complex construct of EI (Humphrey et al., 2007; Zeidner et al., 2002). This meant that my envisaged intervention's relevance would have been limited by its seeming failure to cover the EI domain in a *comprehensive manner* (Edelson, 2006; Nieveen & Folmer, 2013). For instance, by focusing on ability facets, I would have excluded potentially relevant facets such as empathy and optimism, which are only conceptualised within trait models.

If I had decided to apply a mixed EI conceptualisation, such a decision might equally have failed to provide a relevant contribution to existing EI practices. EI contributors, including Gignac (2010) and Joseph and Newman (2010), argue that mixed EI models lack a sound theoretical foundation, and that it seems too broad to be defined as a construct of EI. In this regard, the two most dominant (Cherniss, 2010a) mixed EI models' conceptualisations (Boyatzis, 2009; Bar-On, 2012) have been criticised for being scientifically invalid and unfounded. Firstly, the Boyatzis and Goleman model has been questioned for "its reliance on imprecise terminology, anecdotal evidence, and unsubstantiated claims" (Petrides, 2010, p. 136). Secondly, the research done by Petrides and Fumham (2001) and Derksen, Kramer and Katzko (2002) has found mixed EI facets from the Reuven Bar-On model only correlating with personality traits, and not with abilities. As such, Matthews et al. (2004) indicate that the conceptualisation of mixed EI as a combination of abilities and traits might be unfounded. Similar research findings limit current ability EI models as research done by Austin (2010) indicates that the conceptualisation of ability EI as a unique form of intelligence might be unfounded. Austin (2010) finds that only the ability facet of understanding emotions correlates with psychometric intelligence, suggesting that only one ability facet can be labelled as a unique form of intelligence. As such, in addition to potentially failing to cover the EI domain in a *comprehensive manner*, a mixed or ability EI conceptualisation would seemingly fail to cover the EI domain in a *fair manner* (Edelson, 2006; Nieveen & Folmer, 2013).

Therefore, if I had decided to apply a seemingly unfounded ability or mixed EI conceptualisation as my intervention's content, such a decision may have contradicted the *instructional ALT suggestion* of using teachers' progress as a valid indicator of the intervention's effectiveness (ALT 12.1). As teachers' progress was based on the attainment of potentially unfounded content, such a decision may have lessened the intervention's quality. Cherniss (2010b) similarly argues that findings based on only one EI model should be interpreted and applied with caution (MacCann & Roberts, 2008).

Finally, If I had decided to apply all the EI facets to enhance the intervention's comprehensiveness, I may have contradicted the *ALT suggestions* that the content and objectives of my envisaged intervention should be realistic (ALT 4). As the content of my

envisaged intervention formed the basis for training, measurement and scoring, such a decision may have been an unrealistic endeavour impeding the quality of the envisaged intervention.

Conflicting EI theories rendered the decision on which EI conceptualisation to apply as my envisaged intervention's content problematic. For this reason, I found it sensible to consider potentially alleviating suggestions that might provide a relevant contribution to existing EI practices. EI contributors (Austin & Saklofske, 2010; Cherniss, 2010a; Gardner & Qualter, 2010; Riggio, 2010; Van Rooy et al., 2010) have raised a number of suggestions enabling researchers or developers of future EI interventions to work around the limitation of conflicting EI theories.

#### *3.4.1.3 Alleviating suggestions*

EI contributors (Austin & Saklofske, 2010; Cherniss, 2010a; Riggio, 2010; Van Rooy et al., 2010) suggest focusing on a particular common facet of EI found across various EI models, and which can be linked to the target population's needs and context. This suggestion seemed particularly promising in providing a relevant contribution to existing EI practices.

Although adhering to this suggestion implies that my envisaged intervention only covers a sub-domain of EI, it allows me to do so comprehensively. Cohen et al. (2007, 2011) indicate that if comprehensive domain coverage is not practical, the elements selected should be a fair representation of the wider domain and itself be addressed comprehensively. In terms of comprehensive coverage of the sub-domain, selecting a common EI facet implied that my content represented both an emotional-cognitive ability and personality trait conceptualisation of EI. In terms of a fair representation of the sub-domain, it implied that I could align the common EI facets to a universally agreed-on definition and theory.

In addition, adhering to this suggestion seemed to alleviate the two contradictions to the ALT suggestions (Figure 3.7, ALTs). Firstly, in basing the content on a theoretically agreed on representation of a common EI facet, teachers' progress in attaining the content could be used as a valid indication of the intervention's effectiveness. Secondly, I realised that my envisaged intervention might be regarded as a realistic endeavour if the content and objectives covered only one EI facet comprehensively. Adhering to this suggestion finally allowed me to select a common EI facet that is relevant to teachers' contextualised needs.

#### *3.4.1.4 Conjecture*

The purpose of this sub-section is to describe the selection of a common EI facet and a universally accepted definition and theory thereof. In order to potentially provide a relevant contribution to existing EI practices, I furthermore reflect on the quality of my conjectural

decisions taken in this sub-section. I subsequently updated the conjectural substantive heuristics visualised in Figure 3.7 (EI) to account for the decisions made within this sub-section.

A common facet found across dominant EI models (Kotzé & Venter, 2011), and which is critical and suitable to teachers' contextualised needs is ER (Brackett et al., 2013). Considering the particular content of my envisaged intervention, I scrutinised the proponents of ability and trait EI's conceptualisation of ER. Although the term used to describe ER differs, similar conceptualisations of ER are found amongst dominant EI models. The different terms include, for example, self-management of emotions (Mayer et al., 2004), emotion management (MacCann & Roberts, 2008), or emotion regulation (Petrides, 2010). In essence, these terms refer to the complex emotional process to regulate (or control) one's own emotions by enhancing or reducing (harnessing or changing, fostering or curbing) particular emotions (Brackett et al., 2013; Gosling, 2010; London Psychometric Laboratory, 2018; MacCann & Roberts, 2008; Petrides, 2010) to achieve an intended goal (Brackett et al., 2013; MacCann & Roberts, 2008).

This complex emotional process forms the foundation of Gross's (1998a, 199b) ER Theory, which provides an extensively influential (Thory, 2013) and universally accepted definition and theory for the regulation of one's emotions (Joseph & Newman, 2010; Thory, 2013). Gross (1998b, p. 275; 2014, p. 20) defines ER as "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions." Gross (2014) acknowledges that ER can be conceptualised as an ability or a dispositional trait. In order to critically expand on my decision's relevance, fairness and comprehensiveness; it is necessary to first provide an overview of the ER process derived from Gross's ER theory. As such, in Figure 3.5, I visualise how I intended to apply the emotion regulatory process followed by a short description of each sub-process.

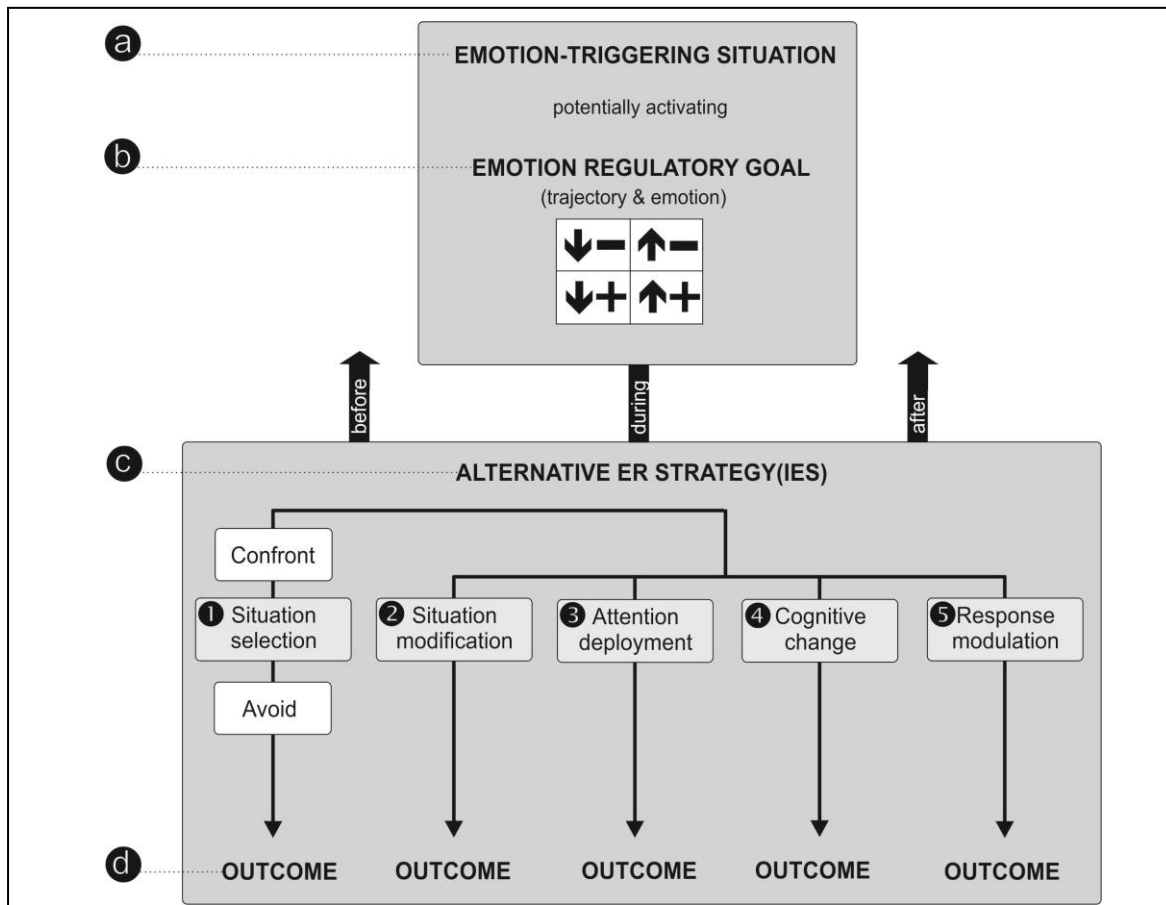


Figure 3.5: The ER process (adapted from Gross, 2014)

In Figure 3.5, I distinguish four sub-processes (*a*, *b*, *c* and *d* on the left of the diagram) that characterised the emotion regulatory process derived from Gross's (2014) ER theory. I furthermore divided the sub-processes into two key events. As such, *a* and *b* represent the prerequisite sub-processes for *c* and *d* to occur. In short, I intended to incorporate a particular emotion-triggering situation (*a*) That might activate a regulatory goal to increase (up-regulate) or decrease (down-regulate) the negative or positive emotion triggered by the situation (*b*). In response to an activated regulatory goal, teachers employ a particular ER strategy(ies) (*c*) that result in a particular outcome (*d*).

Sub-process *a* (Figure 3.5) represents a particular context-bound situation to which teachers might be exposed, and which triggers a positive or negative emotional reaction (EI 5). Examples might include experiencing work-overload (Thory, 2013) or interpersonal conflict with learners.

Sub-process *b* (Figure 3.5) represents a regulatory goal that teachers potentially activate based on their exposure to a particular emotion-triggering situation (*a*) (EI 5). A regulatory goal describes a particular trajectory activated to alter the intensity, duration, and/or quality of a triggered emotion (Gross, 2015). The emotion trajectory entails an emotional need to decrease

(down-regulate), increase (up-regulate) or maintain the negative or positive emotion being triggered (Gross, 2014). Gross (2015) indicates that the down-regulation of negative emotions and the up-regulation of positive emotions occur most often, but that people on occasion also up-regulate negative and down-regulate positive emotions. Sutton (2004) finds that teachers' most common regulatory goal seems to be the down-regulation of negative emotions such as anger and frustration. Sutton (2004) further notes that teachers might experience different emotions from exposure to the same emotion-triggering situations, for example, a defiant learner triggering anger in one teacher might trigger sadness in another<sup>3</sup>.

Sub-process *c* (Figure 3.5) represents Gross's (1998b, 2014) system for classifying ER strategies (EI 7). This sub-process illustrates the ER strategies that teachers might employ to accomplish the emotion regulatory goal (*b*). Gross (1998b, 2014) distinguished five ER strategies, each encompassing a number of sub-strategies elaborated on in Appendix K. A person might employ one or multiple strategies deliberately or non-deliberately (Gross, 2015; Peña-Sarrionandia et al., 2015), all at once or in quick succession of one another (Gross, 2014).

Strategy 1, namely *situation selection* entails an action taken to be in a situation with an expected emotion (Gross, 2014, 2015; Peña-Sarrionandia et al., 2015). This means that one either confronts or avoids particular situations that might elicit a negative emotion(s). An example of avoidance includes teachers refusing to deal with a particular group of learners (Gong et al., 2013). In the event that a teacher decides to confront or approach the emotion triggering situation, he/she might employ ER strategies 1-4 to accomplish the emotion regulatory goal. Strategy 2, namely *situation modification*, entails an action taken to modify a particular situation or alter elements within one's external physical environment, therefore changing its emotional impact (Gross, 2014, 2015; Peña-Sarrionandia et al., 2015). An example of this is teachers preparing for a lesson they might feel anxious about (Sutton, 2004). Strategy 3, namely *attention deployment*, entails directing one's attention towards or away from a situation as to influence one's emotions. Selecting what the person attends to therefore alters how the person would feel (Gross, 2014, 2015; Peña-Sarrionandia et al., 2015), for example, teachers diverting their attention from a troubled situation (Sutton, 2004). Strategy 4, namely *cognitive change*, entails reappraising the situation to change its emotional significance or meaning in order to alter its emotional impact (Gross, 2014, 2015; Peña-Sarrionandia et al.,

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<sup>3</sup> Alternative examples of emotion regulatory goals include:

- The need to maintain or increase enthusiasm when a teacher has to mark 100 English literature assignments (maintaining/up-regulating a positive emotion);
- The need to maintain or increase anger when a teacher wants to show unruly learners that he or she is getting worked-up (maintaining/up-regulating a negative emotion);
- The need to avoid laughing when a learner is being naughty but funny (down-regulating a positive emotion).

2015). This means thinking differently about the situation or about one's capacity to manage the demands of the situation (Peña-Sarrionandia et al., 2015). An example of this is teachers deciding to change their opinion about student learning or deciding to only think positive thoughts (Gong et al., 2013). Strategy 5, namely *response modulation*, entails directly influencing or altering one's emotional response tendencies, whether experiential, physiological and/or behavioural (Gross, 2014, 2015; Peña-Sarrionandia et al., 2015). When employing response modulation, one attempts to "intensify, diminish, prolong or curtail the ongoing emotional experiences, expression or physiological responding." (Gross, 1998b, p. 225). An example of this is teachers deciding to take an anxiety tablet to decrease their anxiety.

These strategies can seemingly be employed before, during or after the emotion-triggering situation (Gong et al., 2013; Koole, as cited in Fried, 2011; Sutton, 2004; Thory, 2013). An example of this is a teacher employing cognitive change by thinking about an upcoming emotion-triggering situation from another teacher's perspective before, during or after the situation occurs.

Sub-process *d* (Figure 3.5) represents the outcome of the ER strategies that teachers employ to accomplish a particular regulatory goal (EI 8). The outcome entails the short- or long-term consequences that a person's choice of ER strategies might have on the emotion dynamics (Gross, 2014). I considered three potential consequences. For example, three consequences of a teacher down-regulating their frustration with a defiant learner by screaming at the learner might be:

- That the teacher feels 'better' emotionally (emotional consequence);
- That the learner stops being defiant (short-term situational consequence); and
- That the teacher-learner relationship deteriorates (long-term situational consequence).

In order to conjure and justify the meaningfulness of my content-related decisions discussed thus far, it is necessary to critically reflect on the quality thereof.

### ***Quality reflection***

I reflected on the relevance of these decisions to teachers' contextualised needs, as well as to the ALT suggestions generated. I furthermore reflected on my envisaged content's coverage of state-of-the-art information in a fair and comprehensive manner.

Gross (2014) acknowledges that ER can be conceptualised as an ability or a dispositional trait. This is also evident in research studies investigating some aspect of Gross's ER theory while proceeding from either an ability (Reijntjes et al., as cited in Gross, 2014) or trait (Betts, Gullone & Allen, as cited in Gross, 2014) viewpoint. Gross's ER theory furthermore encompasses

regulatory processes identified in different theories of emotion (Gross, 2014; Peña-Sarrionandia et al., 2015), and provides a comprehensive and universally accepted system of classifying ER strategies (MacCann, 2006; Thory, 2013) to increase or decrease the emotions experienced. For these reasons, I found the application of Gross's (1998a, 1998b) ER theory as a *fair and comprehensive* representation of ER as a sub-domain of EI literature.

Gross's (1998a, 1998b) classification of ER strategies has successfully been linked to the teaching profession (Fried; 2011, Thory, 2013). This is evident in research (Gong et al., 2013; Sutton, 2004) investigating the ER strategies that teachers employed. Although the literature on the training and application of ER geared towards teachers is limited (Gong et al., 2013; Thory, 2013), ER in particular has been described as a critical need of teachers (Brackett et al., 2013; Newberry, 2013). This seems to stem from the notion that emotions manifest themselves at a higher intensity and more frequently among teachers compared to other professions (Back, as cited in Dolev & Lesham, 2017). It also seems to further demonstrate that teachers are currently underprepared for the ER demands of their job (Newberry, 2013). ER seems to influence teachers' ability or inability to cope with the emotional demands of the profession (Brackett et al., 2013; Fried, 2011; Jennings & Greenberg, 2009). Teachers with sufficient ER abilities have been associated with productive classrooms, principal support, job satisfaction (Brackett, Palomera, Mojsa-Kaja, Reyes, Salovey, as cited in Brackett et al. 2013), job performance (Joseph & Newman, 2010), and intrinsic motivation (Linnenbrink & Pintrich, as cited in Fried, 2011). This means that ER can be viewed as a critical professional development tool for teachers (Joseph & Newman, 2010), which emphasises ER's *relevance to the contextualised needs of teachers*. Given the agreement about the need for an effective ER intervention for teachers (Newberry, 2013), it is concerning that ER interventions explicitly grounded in ALT are lacking.

Applying the ER process (Figure 3.5) derived from Gross's (1998a, 1998b) ER theory logically connects to particular *ALT suggestions* generated; in particular, Kolb's (1984) experiential stages applied within teachers' real-life contextual setting (Figure 3.7, ALTs). Following Kolb's (1984) experiential stages, teachers physically experience an emotion-triggering situation potentially activating an emotion regulatory goal to decrease or increase the emotion experienced (ALT & EI 5). In order to regulate the emotion, teachers subsequently immediately employ one or more ER strategies (ALT & EI 7). Reflective observation follows based on the outcome of ER strategies employed (ALT & EI 8). Teachers report on the outcome, or the emotional, short- and long-term situational consequences (ALT & EI 9). This means that teachers need to apply abstract conceptualisation of the appropriateness of the strategies employed in order to report on, for example, the long-term situational consequences. Reflective observation is further promoted through feedback from continuous assessment of performance



(ALT 11 & 12.1) and an online learning community's input (ALT 12.2). These sources of reflective observation help teachers to think about ways to improve on the outcome and potential consequences experienced (abstract conceptualisation). The cycle is thereafter repeated with a new ER situation to experience and with which to actively experiment. As such, experiential learning is promoted through cycles of situational ER experiences, as well as continuous experimentation with a range of ER strategies.

In addition, by selecting ER, and addressing a critical need of teachers, my decision supports the *instructional ALT suggestion* that the content, goals and objectives of my envisaged intervention are significant and relevant to teachers' contextual needs (ALT 4). In turn, contextually experiencing and experimenting with ER might highlight the usefulness (ALT 4) and benefit of learning about their own ER (ALT 5).

The process of selecting an appropriate and stable theory of EI to use as the basis of my envisaged intervention design assisted me in meaningfully reflecting on the limitations of existing EI measurement and scoring methods. This was done as part of assessing teachers' EI performance in contextualised environments.

### **3.4.2 Measurement and scoring of the envisaged intervention**

Obtaining an indication of teachers' ER practices and performance during the experiential stages serves a number of purposes related to the ALT suggestions. Firstly, continuously assessing teachers' own beliefs about their ER practices and their actual ER practices provides an indication of transformational learning (ALT 11). This implies the incorporation of a measurement method that can be used to determine if there is a discrepancy between teachers' espoused theories and their theories-in-use (Argyris & Schön, 1974; Merriam & Bierema, 2014). Secondly, continuously assessing how competently teachers regulated a triggered emotion provides an indication of experiential learning taking place (ALT 11). This refers to the incorporation of a measurement and scoring method that can be used to determine teachers' ER competency. Thirdly, providing the results in the form of an ER performance and progress report (ALT 12.1) provides information for teachers' critical reflection. Such a report might furthermore highlight individual ER strengths and weaknesses that might be used by the facilitator to customise learning in order to accommodate teachers' individual ER needs. This report might finally be used by the researcher as an indication of learning attainment during the intervention, and as an indication of the intervention's effectiveness.

In the EI literature review, measurement and scoring methods refer to the design components of assessment or evaluation. In this study, assessment entails the methods selected to measure

and score teachers' learning during or after the intervention. Alternatively, evaluation entails the methods selected to measure and score the effectiveness of the intervention. In this study, I furthermore distinguish between measurement and scoring aligned to their purpose in my envisaged intervention. While measurement refers to the methods used to obtain information about teachers' ER; in this study scoring refers to the methods used to determine the appropriateness of teachers' ER choices (MacCann, 2006). As such, the content of my envisaged intervention could be measured and scored.

Based on the ER process (Figure 3.5) derived from Gross's (1998a, 1998b) ER theory, the content to be measured and scored constituted the ER strategies being employed by teachers in order to regulate a particular triggered emotion. In line with existing EI terminology (MacCann, 2006), I refer to the ER situations presented to teachers (EI 5) as 'response items' within my discussions about measurement and scoring practices. I refer to the ER strategies potentially employed by teachers (EI 7) as 'response options'. If, for example, an emotion-triggering situation (response item) depicts a group of boys swearing at a female teacher, she might attempt to down-regulate her anger by employing one or more ER strategy (response options), such as removing the boys from the class and talking to them or yelling at the boys.

In order to accommodate the intended content based on ALT suggestions, I selectively considered measurement and scoring methods that supported my conjectural decisions. To guide the quality of the remaining EI literature review, I continuously reflected on my measurement and scoring decisions' relevance to teachers' contextualised ER needs, as well as to the ALT suggestions generated. I contended with my attempt to provide fair and comprehensive coverage of the actual defined content (Cohen et al., 2011; Edelson, 2006) on which I based the measurement and scoring. As such, I henceforth focused on providing a relevant contribution to existing EI measurement and scoring practices. In order to incorporate measurement methods that could obtain information about teachers' ER strategies, I herewith discuss existing EI measurement methods, their associated delimitations, alleviating suggestions, and my conjectural decisions in more detail.

#### *3.4.2.1 Limitation 2: Measurement methods*

In support of the ALT suggestions and the purposes for conducting the measurement described, I intended to incorporate (1) A measurement method that could obtain information about teachers' own beliefs about their actual ER strategies, as well as (2) A measurement method that could obtain information about teachers' actual employed ER strategies. Teachers' beliefs about their own actual ER strategies entails a subjective judgement (Brackett et al., 2013), which does

not require objective measurement methods. In contrast, measuring the actual ER strategies employed by teachers requires an objective measurement method (Zeidner et al., 2002) uninfluenced by emotions or personal prejudices (The American Heritage Dictionary of the English Language, 2018). In order to incorporate measurement methods that could support the ALT suggestions, I herewith review the existing dominant (Cherniss, 2010a) EI measurement methods' delimitations in obtaining information about individuals' ER practices.

#### *3.4.2.2 Delimitations*

Existing dominant (Cherniss, 2010a) EI measurement methods seem to be limited by two problems. Firstly, their inherent subjectivity; and secondly their seeming failure to measure actual ER practices. In order to elucidate the significance of the two measurement problems, I now provide an overview of the two measurement methods currently dominating the field of EI.

The first method entails completing a paper-based performance test (Joseph & Newman, 2010). The second method entails reporting on one's own emotions by completing a paper-based self-report; or reporting on others' emotions by completing a paper-based observer-report (MacCann, 2006). As such, these methods are classified as being either performance-orientated or perception-orientated (Gignac, 2010; Joseph & Newman, 2010), as reporting on one's own or others' emotions taps into perception (Pérez et al., 2005; Petrides, 2010). In order to critically expand on the two measurement methods, in Table 3.2 I provide a representative example, summary and potential delimitations for their use in my envisaged intervention.

Table 3.2: Performance- and perception-orientated measurement methods (Austin, 2010; Cherniss, 2010a; Gosling, 2010; London Psychometric Laboratory, 2018; Matthews et al., 2004; Zeidner et al., 2002)

Methods	Performance-orientated	Perception-orientated
<b>Examples</b>	<p><b>Response items:</b> Emotion related problem-solving tasks.</p> <p>Example: Wai-Hin and Connie have shared an office for years but Wai-Hin gets a new job and Connie loses contact with her. What action would be the most effective for Connie?</p> <p><b>Response options:</b> Multiple choice or ‘rate the extent’ scales to identify the most appropriate strategy to improve emotions and to manage a problem out of several strategies presented in a given contextual scenario. Example of multiple choice:</p> <ol style="list-style-type: none"> <li>(1) Just accept that she is gone and the friendship is over.</li> <li>(2) Ring Wai-Hin and ask her out to lunch or coffee to catch up.</li> <li>(3) Contact Wai-Hin and arrange to catch up but also make friends with her replacement.</li> <li>(4) Spend time getting to know the other people in the office, and strike up new friendships.</li> </ol> <p>Example of ‘rate the extent’: Rating each multiple-choice option (1-4) on a scale from 1 = Not at all effective to 6 = Extremely Effective</p>	<p><b>Response items:</b> Emotion related self-report statements based on a respondent’s own judgement of their typical performance in daily life. Examples:</p> <ul style="list-style-type: none"> <li>• I usually find it difficult to regulate my emotions.</li> <li>• It’s easy for me to talk about my feelings to other people.</li> </ul> <p><b>Response options:</b> A Likert scale Example: 1= Completely Disagree, to 7 = Completely Agree</p> <p>An observer-report measure is based on the opinion of colleagues or acquaintances rating an individual.</p>
<b>Summary of method</b>	Respondent subjectively selects what own actual ER strategies would or should be from a stagnant and pre-determined list of fictional ER strategies in response to a fictional paper-based ER situation.	Respondent subjectively selects if they perceive a pre-determined paper-based statement about own or others’ actual real-life ER practices to be true or not.
<b>Potential delimitations</b>	<p><b>Does it measure ER strategies objectively?</b></p> <p>No, it gathers respondents’ subjective responses about what they think their ER strategy should or would be.</p> <hr/> <p><b>Does it measure actual ER strategies?</b></p> <p>No, it measures what a respondent knows they deliberately would or should do, as opposed to actual ER strategies employed.</p> <p>Potentially fails to measure:</p> <ul style="list-style-type: none"> <li>• Non-deliberate ER strategies.</li> <li>• Context-bound ER strategies.</li> </ul>	<p><b>Does it measure ER strategies objectively?</b></p> <p>No, it gathers respondents’ or observers’ subjective responses about their own or others’ ER.</p> <hr/> <p><b>Does it measure actual ER strategies?</b></p> <p><u>Self-reporting:</u> No, it measures what a respondent deliberately knows about their ER, as opposed to actual ER. Potentially fails to measure:</p> <ul style="list-style-type: none"> <li>• Non-deliberate ER strategies.</li> <li>• Context-bound ER strategies.</li> </ul> <p><u>Observer-reporting:</u> No, it measures what an observer deliberately knows about others’ ER, as oppose to actual ER. Potentially fails to measure:</p> <ul style="list-style-type: none"> <li>• Non-observable ER strategies.</li> <li>• Context-bound ER strategies.</li> </ul>

As reflected in Table 3.2, I focused only on the methods used to measure ER strategies, and therefore disregarded different measurement instruments' conceptualisation of EI facets as ability, trait or mixed EI. As such, I discuss measurement information that is relevant to the ALT suggestions, or the intended measurement purpose described.

Commencing with the performance-orientated method, I critically expand on each measurement method's delimitations. In order to consider particular alleviating suggestions, and to guide my conjectural decisions, I thereafter describe these two methods' relevance to teachers' contextualised ER needs, and to the ALT suggestions generated.

### ***The performance-orientated method***

The performance-orientated method measures an individual's performance in a range of problem-solving tasks (Pérez et al., 2005; Petrides, 2010). As such, this method asks respondents, for example, to select the most appropriate ER strategy from a stagnant and pre-determined list of fictional options in response to a fictional emotion-related problem (MacCann, 2006). As indicated in Table 3.2, two delimitations deter the use of the performance-orientated method in my envisaged intervention, firstly, its inherent subjectivity, and secondly its seeming failure to measure actual ER strategies employed.

The seeming subjectivity is based on the notion that the response option selected by respondents is dependent on their opinion or their "knowledge, and capacity to reason about emotions and emotional situations" (Lopes et al., as cited in Gross, 2014, p. 484). This means that selecting the most appropriate answer in actual fact measures respondents' deliberate (conscious) declarative knowledge, or what they know they 'should' or 'would' do in a given situation (Austin, 2010; Matthews et al., 2004).

The seeming failure to measure actual ER strategies employed is based on the notion that respondents deliberate declarative knowledge about their ER strategies does not account for actual (Austin, 2010; Matthews et al., 2004) ER strategies being employed. Matthews et al. (2004) indicate that automatic procedural knowledge, or knowing 'how', displays expertise and that a person who is considered an expert in a particular activity has little conscious awareness of the processes involved in being competent (Kraiger et al., 1993). This means that the respondent might omit information about non-deliberate ER strategies employed. In addition, selecting the ER strategy deemed most appropriate depends essentially on the contextual situation at hand (Austin, 2010; Gross, 2014; MacCann, 2006; Matthews et al., 2004). As such, de-contextualised measurement is regarded as one of the key factors contributing to a lack of

transfer between what is being measured and actual real life (Cherniss, 2010a; Ybarra et al., 2014).

### ***The perception-orientated method***

The perception-orientated method measures individuals' perception about their own or others' ER practices (Pérez et al., 2005; Petrides, 2010). This method therefore asks respondents or observers, for example, if they agree or disagree with a pre-determined statement about own or others' actual real-life ER practices. As indicated in Table 3.2, two delimitations equally deter the use of the perception-orientated method in my envisaged ER intervention, firstly its inherent subjectivity, and secondly its seeming failure to measure actual ER strategies employed.

The seeming subjectivity is based on the notion that respondents or observers make subjective judgements about their own or others' ER practices (Brackett et al., 2013). Self-reporting measures are deemed vulnerable to deception, social desirability, and image management (Zeidner et al., 2002). This means that respondents might inaccurately report on their own ER practices for the purpose of portraying a more or less desirable image of their ER practices (Schutte et al., 1998). Observer-reporting measures are deemed equally vulnerable to social politics and popularity (Cherniss, 2010a). This means that observers might inaccurately report on others' ER for the purpose of portraying a more or less desirable image of another's ER practices.

The seeming failure to measure actual ER strategies employed is based on the notion that perception-orientated methods equally measure respondents or observers' deliberate declarative knowledge about their own or others' ER practices (Austin, 2010; Matthews et al., 2004). This means that the method measures what the respondents or observers know or believe about their own or others' ER practices (Austin, 2010; Matthews et al., 2004). Such measures are potentially plagued with inaccuracies. Jennings and Greenberg's (2009) meta-analysis, and that of Levenson and Ruef (as cited in Gross, 2014) indicate that teachers are less competent in ER as what they perceive themselves to be. Furthermore, as some emotional processes (Matthews et al., 2004), including ER strategies (Gross, 2014), are not necessarily consciously experienced, it is likely that a respondent might omit information about non-deliberate ER practices.

In addition, as indicated in Table 3.2, the perception-orientated method consists of contextually depleted statements about which respondents or observers are making their judgements (Gosling, 2010; Humphrey et al., 2007; Matthews et al., 2004). This means that the current

perception-orientated method disregards the notion that different contexts might elicit different ER strategies (Matthews et al., 2004).

Perception-orientated measurement conducted through an observer report could also deter the measurement of actual ER strategies. This is based on the notion that not all ER strategies are necessarily observable. For example, an observable ER strategy might include a teacher yelling at a group of boys, whereas unobservable ER strategies might include a teacher pretending not to care, therefore suppressing the felt emotion or deciding to think only positive thoughts.

### ***Quality reflection***

As I reflected on the quality criteria of relevance, fairness and comprehensiveness during Phase 1 (refer to Sub-section 2.5.4, Chapter 2), the decision as to which measurement methods to apply needed to provide a relevant contribution to existing EI measurement practices (Nieveen & Folmer, 2013; Plomp, 2013). I contended with my attempt to provide fair and comprehensive coverage of the actual defined content (Cohen et al., 2011; Edelson, 2006) discussed in Sub-section 3.4.1, and therefore reflected on the relevance of these two methods in relation to teachers' contextualised needs, and the ALT suggestions generated.

Neither the performance- nor the perception-orientated methods seemed relevant in their current form. This is due to their seeming failure to objectively measure actual ER strategies being employed by teachers. In particular, these measures seemed to measure only deliberate and observable ER strategies being employed, while non-deliberate, context-bound and non-observable ER strategies were being disregarded. This means that potentially inaccurate measurement results obtained from these methods would be used for the purposes described.

Ideally, to support the ALT suggestions and the purposes for conducting the measurement described, I needed to incorporate objective measurement methods (Zeidner et al., 2002) that could account for the actual ER strategies being employed by teachers. Based on the delimitations reviewed earlier, measuring actual ER strategies employed by teachers ideally entail methods that account for:

- Deliberate and non-deliberate ER strategies (Brackett, 2014; Ybarra et al., 2014).
- Context-bound ER strategies (Shaughnessy et al., 2013; Ybarra et al., 2014).
- Observable and non-observable ER strategies (Shute et al., 2009).

As reflected, existing measurement limitations rendered my decision on which measurement methods to incorporate in my envisaged intervention problematic. For this reason, I found it sensible to consider potentially alleviating suggestions that might support the context-bound

nature of the ALT suggestions, and that might provide a relevant contribution to existing EI measurement practices. EI contributors (Bichelmeyer et al., 2010; Brackett, 2014; Cherniss, 2010a; Jennings & Greenberg, 2009; Matthews et al., 2004; Shaughnessy et al., 2013; Webb et al., 2013; Ybarra et al., 2014; Zeidner et al., 2002) have raised a number of suggestions enabling researchers or developers of future EI interventions to alleviate some of the existing measurement limitations. Two suggestions seemed particularly promising to alleviate some of the relevancy concerns described earlier.

#### *3.4.2.3 Alleviating suggestions*

I considered two closely associated suggestions to alleviate existing measurement methods' seeming failure to measure actual ER strategies. Firstly, EI contributors (Bichelmeyer et al., 2010; Cherniss, 2010a; Shaughnessy et al., 2013; Ybarra et al., 2014) argue for contextual consideration by suggesting that designers of EI measurement methods consider integrating measurement into a variety of real-life authentic contextual situations, including through game-based or simulated learning exercises (Brackett, 2014; Cherniss, 2010a; Webb et al., 2013). Secondly, EI contributors suggest the incorporation of real-time (Brackett et al., 2013) and real-life observations of behavioural manifestations (Jennings & Greenberg, 2009; Matthews et al., 2004; Sutton, 2004) within a real-life integrated intervention.

These two suggestions seemed to possibly provide a relevant contribution to existing EI practices, and associate comfortably with the ALT suggestions. Within my envisaged intervention, I incorporated authentic contextualised real-life ER situations (ALT & EI 5) within an experiential learning cycle conducted through strategies such as a simulation or games (ALT 2). These ER situations represent the measurement response items. I furthermore envisaged teachers employing actual real-life ER strategies (ALT & EI 7) in response to the ER situations experienced. These ER strategies represent the measurement response options. Incorporating real-time and real-life observation of behavioural manifestations allowed for the measurement of actual ER strategies being employed by the participating teachers. In particular, this included context-bound, deliberate, non-deliberate, and observable ER strategies. However, as demonstrated earlier, not all ER behaviour is observable, and would therefore require incorporating teachers' own input with regard to their own actual unobservable ER strategies employed.

From the EI literature review, I could not find any suggestions to alleviate existing measurement methods' inherent subjectivity, particularly for measuring ER. As described in the conjecture to



follow, I attempted to partially alleviate this limitation by means of comparing the two measurement methods decided on.

#### *3.4.2.4 Conjecture*

The purpose of this sub-section is to practically describe my conjectural decisions. This involves how I attempted to alleviate existing measurement delimitations based on EI contributors' suggestions. In order to potentially provide a relevant contribution to existing EI measurement practices, I furthermore reflect on the quality of my conjectural decisions taken in this sub-section. I subsequently updated the conjectural substantive heuristics visualised in Figure 3.7 (EI) to account for the decisions made within this sub-section.

Based on the alleviating suggestions, I decided to apply a serious game containing the authentic ER situations gathered from the teachers (response items); and from which actual ER strategies (response items) might be inferred through an observer-, teacher-, and objectivity-report.

Practically, these decisions entailed:

1. How I transformed the ER process (Figure 3.5) derived from Gross's (1998a, 1998b) ER theory into a variety of real-life authentic and contextualised response items and options.
2. How I adapted existing measurement methods to incorporate observation- and self-reporting of actual ER behaviour, and simultaneously improve on measurement objectiveness.
3. How I went about designing a serious game that incorporated the conjectural substantive heuristics and that ensured optimum learning, measurement and scoring.

Firstly, transforming the ER processes of teachers entailed conceptualising a variety of real-life situations to which teachers could relate. Therefore, in support of my ALT suggestions (ALT 1), I decided to rely on a variety of ***actual ER experiences of teachers*** as pre-determined ER situations and goals to be represented in a similar manner in my envisaged intervention (EI 5).

This included potential ER strategies to be used as an initial set of possible response options to choose from. This means that a teacher reports on the ER strategies that they have employed by selecting the relevant strategies from a list of strategies representing Gross's (1998a, 1998b) ER strategy classification system (EI 9). Based on the ER process (Figure 3.5) derived from Gross's (1998a, 1998b) ER theory, I therefore conducted qualitative interviews with in-service teachers. I gathered information about the teachers' prior and current ER experiences (EI 1) with regard to:

- Particular emotion-triggering situations and the emotion regulatory goal(s) activated (response items); and
- ER strategies employed to achieve regulatory goal(s) activated (response options).

Secondly, adapting existing measurement methods entailed incorporating methods that might measure actual ER behaviour and improve on measurement objectiveness. Therefore, I decided to incorporate *three measurement reports by adapting the existing performance-orientated measurement method*. My adaptation accounts for a method to infer which actual ER strategies teachers employed during the real-life contextual intervention. The actual ER strategies employed by teachers (response options) in response to the ER situations they were exposed to in the intervention (response items) could be reported on by the teachers themselves, and by observers witnessing the teachers' employment of the ER strategies.

The three measurement reports I decided to incorporate are teacher-, an observer-, and an objectivity-report. In Table 3.3, I summarise the measurement reports in comparison with the existing performance-orientated measurement method, followed by an explanation of each method.

Table 3.3: My envisaged intervention's measurement methods in comparison with an existing EI measurement method

<b>Existing performance-orientated measurement method</b>	<b>Method 1 Teacher report</b>	<b>Method 2 Observer report</b>
Teacher	Teacher	Observer
subjectively selects what own actual deliberate	subjectively selects what own actual deliberate	subjectively selects what teacher's actual deliberate non-deliberate
observable non-observable	observable non-observable context-bound	observable context-bound
ER strategies would or should be from a Stagnant and pre-determined list of fictional ER strategies in response to a fictional paper-based ER situation	ER strategies was from a continuously updated and pre-determined list of actual ER strategies in response to an actual real-life ER situation	ER strategies was from a continuously updated and pre-determined list of actual ER strategies in response to an actual real-life ER situation

  
**Method 3**  
**Objectivity report**

Reflective of Table 3.3, I adapted the existing performance-orientated measurement method to account for the actual real-life employment of the ER strategies observed, and on which the teachers reported.

Applying method 1 (EI 9 & 11), a teacher-report, entails a teacher being presented a pre-determined emotion-triggering situation such as a group of boys disrupting a lesson. In order to down-regulate an activated emotion such as frustration, the teacher would employ one or more ER strategy. After this real-life ER occurrence, the teacher is then presented with a list of ER strategies that he or she has likely employed. For example, yelling at the group of boys; removing the group of boys from the class and talking to them; ignoring the group of boys; starting to tell jokes; focusing on eager learners; the teacher accepting that they could not do anything; pretending not to care; or calling a higher authority. As such, the teacher selects or adds what he or she actually did to regulate his or her emotions. This pre-determined and continuously updated list constitutes all previous ER strategies from the teachers presented with the same ER experience. This method allows for the inference of deliberate, observable, non-observable and context-bound ER strategies employed by teachers. As it would be reported on by the teachers themselves, this method accounts for information about the teachers' own beliefs about the actual ER strategies that they employ, i.e. their espoused theory (Argyris & Schön, 1974).

Applying method 2 (EI 9 & 11), an observer-report, entails that an observer, which might be one of the disruptive boys, would witness the emotion-triggering situation, as well as the teacher's ER response to the situation. After this real-life ER occurrence, the observer is presented with the same list of ER strategies, excluding non-observable strategies. As such, the observer selects or adds what he or she witnessed the teacher actually doing to regulate his or her emotions. This method allows for the inference of deliberate, non-deliberate, observable and context-bound ER strategies employed by teachers. This method furthermore contributes to measurement objectiveness as observers report on the actual ER behaviour witnessed, as opposed to what they thought the teacher's ER practices would entail. As it would be reported on by an observer, this method accounts for information about teachers' actual ER strategies being employed, i.e. their theories-in-use (Argyris & Schön, 1974).

Applying method 3 (EI 11), an objectivity report, entails the comparison of the teacher and observer report to highlight discrepancies. Based on the notion that at least one selected or added observable response option would be a likely match between the two reports, response items indicating no match would be earmarked as potentially subjective. For example, an observer reporting that the teacher yelled at the group of boys, and the teacher reporting that

he or she started telling jokes. This method contributes to measurement objectivity, as well as providing an indication of transformation learning based on the discrepancy between the espoused theory and theories-in-use (Argyris & Schön, 1974).

Thirdly, designing a serious game entails incorporating the conjectural substantive heuristics in such a way as to contribute to effective learning, measurement and scoring. Therefore, I decided to integrate teachers' real-life experiences and the measurement methods into ***game- or simulation-based exercises***. The concept of a game and of a simulation is commonly depicted as similar applications (Garris et al., 2012), albeit the slight differentiation that a game includes features such as score-keeping and challenges to be completed in order to advance in the game (Annetta, 2010; Garris et al., 2012; Sauvé et al., 2007). As I envisaged the measurement and scoring of the teachers' ER strategies, I decided on the use of a game. I particularly investigated the use of a serious game design for the following reasons:

- Serious games combine the fun element of games with the educational purpose of learning (Michael & Chen, 2006).
- Serious games are favourable for the purposes of learning and measurement (McClarty et al., 2012).
- Serious game design provides for an all-encompassing scope for both digital and analogue game applications (Breuer & Bente, 2010).
- Serious game literature provides authoritative research in the field of learning games (De Freitas & Routledge, 2013).

As described in Chapter 4, this meant that I incorporated the conjectural substantive heuristics generated into a serious game design (EI 2), ensuring optimum learning, measurement and scoring. In order to conjure and justify the meaningfulness of my measurement-related decisions discussed thus far, it is necessary to critically reflect on the quality thereof.

### ***Quality reflection***

As I reflected on the quality criteria of relevance, fairness and comprehensiveness during Phase 1 (refer to Sub-section 2.5.4, Chapter 2), my measurement-related conjectural decisions needed to provide a relevant contribution to existing EI measurement practices of teachers (Nieveen & Folmer, 2013; Plomp, 2013). I contended with my attempt to provide fair and comprehensive coverage of the actual defined content (Cohen et al., 2011; Edelson, 2006) discussed in Sub-section 3.4.1, and therefore reflected on the relevance of these decisions to teachers' contextualised needs, as well as to the ALT suggestions generated.

Gathering a variety of expressed ER experiences of teachers through conducting qualitative interviews with in-service teachers means that I was able to consider and incorporate *teachers' contextualised ER needs*. This conjectural decision furthermore logically connects to a number of *ALT suggestions*:

- The integration of a variety of authentic ER situations to be solved in teachers' real-life contextual setting (ALT 5).
- The employment of ER strategies to potentially 'solve' an authentic problem experienced (ALT 7).

The application of a serious game design also logically connects with the *ALT suggestion* of incorporating learning strategies such as a game (ALT 2). The incorporation of the three measurement reports finally logically connects with a number of *ALT suggestions*. Comparing the teacher's report with the observer's report in the form of the objectivity report elicited a determination of transformational learning taking place (ALT 11). Transformational learning is inferred from no discrepancy between the teachers' espoused theories, referring to what they believe their actual ER strategies to be, and their theories-in-use referring to the actual ER strategies that they employed (Argyris & Schön, 1974; Merriam & Bierema, 2014). These measurement methods also allowed for the provision of technology assisted learner analytics containing real-time information about teachers' performance and progress (ALT 12.1). I have decided to use a digital cell-phone application for teachers and observers to report on, which will simplify and automate the measurement procedures. The progress report generated from these measurements will furthermore be used for the purpose of teacher reflection, customising learning on the basis of teachers' contextualised ER needs, or as an indication of learning attainment.

While measurement methods involved the methods used to obtain information about the teachers' ER; in this study, scoring refers to the methods used to determine the appropriateness of the teachers' ER strategy choices (MacCann, 2006). The scoring assigns a competency score based on the teachers' and observers' response options selected. In order to incorporate a method that could distinguish between the more or less appropriate ER strategies employed, in the following section I discuss existing EI scoring methods, their associated delimitations, alleviating suggestions, and my conjectural decisions in more detail.

#### *3.4.2.5 Limitation 3: Scoring methods*

As indicated in the ER process (Figure 3.5) derived from Gross's (1998a, 1998b) ER theory, each ER strategy employed results in a particular outcome or particular consequence (Gross, 2014).

One might argue that a desirable or helpful outcome reflects an appropriate ER strategy, and an undesirable or hurtful outcome reflects an inappropriate ER strategy (Gross, 2015). As it is not always possible to witness the outcome of the ER strategies selected, various methods will be applied to score the ER observed in this intervention.

In support of the ALT suggestions (Figure 3.7, ALTs), I incorporated a scoring method that could provide a determination of the teachers' ER competency based on the appropriateness of their ER strategy choices. This means that the teachers' ER competency will be determined during each context-bound experiential cycle or new ER situation experienced. This provides an indication of the teachers' experiential learning attainment and the intervention's effectiveness. In order to incorporate scoring methods that could support the ALT suggestions, I reviewed the existing dominant (Cherniss, 2010a) EI scoring methods' delimitations for determining ER strategy appropriateness.

#### *3.4.2.6 Delimitations*

Existing dominant (Cherniss, 2010a) EI scoring methods that include a determination of ER competence seem to be limited by two problems. Firstly, their inherent subjectivity (Fiori et al., 2014; Matthews et al., 2004); and secondly their seeming lack of contextual consideration (Austin, 2010; MacCann, 2006; Matthews et al., 2004). A subjective scoring method entails a method influenced by human judgement (MacCann, 2006). In turn, a contextually-sensitive scoring method entails the consideration that ER is context dependent, and that ER strategies have different consequences in different contexts (Gross, 2015; Sheppes et al., 2014).

In order to elucidate the significance of the two scoring problems, I will now provide an overview of the existing dominant (Cherniss, 2010a) EI scoring methods that include the scoring of ER competency or effectiveness. As this involves determining the most appropriate option selected (MacCann, 2006), these scoring methods are used for performance-orientated measurement methods (MacCann, 2006). The two scoring methods are consensus and expert scoring (Mayer et al., 2004).

Commencing with consensus scoring, I critically expand on the consensus and expert scoring methods' delimitations. In order to consider particular alleviating suggestions, and to guide my conjectural decisions, I thereafter describe these two methods' relevance to teachers' contextualised ER needs, and to the ALT suggestions generated.

### ***Consensus scoring***

Consensus scoring depends on large numbers of respondents' judgements of what the seemingly correct or most appropriate response option is (Matthews et al., 2004; Mayer et al., 2004). Consensus scoring's seeming subjectivity is based on the notion that selecting the most appropriate response option predominantly indicates conformity with subjective human judgement, therefore the social norms of the particular sample population being used (Matthews et al., 2004). Fiori et al. (2014) and Matthews et al. (2004) indicate that an easy response item equals a high percentage consensus, while a difficult response item results in a low percentage of consensus.

The seeming lack of contextual consideration is based on the notion that a response option's appropriateness is context-dependent (Gross, 2014; MacCann, 2006). For example, the research indicates that the appropriateness of the response modulation ER sub-strategy of suppression (Gross, 2014) varies amongst cultures (Butler, Lee & Gross, as cited in Sheppes et al., 2014) and situations (Bonanno & Keltner, as cited in Sheppes et al., 2014).

### ***Expert scoring***

Expert scoring depends on a pool of emotion experts' judgements of what the seemingly most appropriate response option is (Matthews et al., 2004; Mayer et al., 2004). Therefore, expert scoring relies on the mean expert rating of each response option, or the proportion of experts selecting each response option as being the most appropriate (MacCann & Roberts, 2008, p. 79). As the particular selection represents an appropriate ER strategy, appropriateness depends on conformity with the opinion of a pool of selected psychologists, psychiatrists, and philosophers (Matthews et al., 2004; Mayer et al., 2004).

Expert scoring's seeming subjectivity is based on the notion that selecting the most appropriate response option predominantly indicates conformity with the experts' subjective human judgement (MacCann, 2006). Research (Roberts et al., as cited in MacCann, 2006) indicates that such subjectivity particularly applies to respondents sharing similar characteristics as the pool of experts, e.g. white males scoring higher under a pool of predominantly white male experts. Fiori et al. (2014) furthermore indicate that the response option perceived as the most appropriate is in most cases not the response option associated with the highest EI competency. The seeming lack of contextual consideration is based on the same notion as in the case of consensus scoring.

### ***Quality reflection***

As I reflected on the quality criteria of relevance, fairness and comprehensiveness during Phase 1 (refer to Sub-section 2.5.4, Chapter 2), the decision as to which scoring method to apply needed to provide a relevant contribution to existing EI scoring practices (Nieveen & Folmer, 2013; Plomp, 2013). I contended with my attempt to provide fair and comprehensive coverage of the actual defined content (Cohen et al., 2011; Edelson, 2006) discussed in Sub-section 3.4.1, and therefore reflected on the relevance of these two methods in relation to teachers' contextualised needs, and the ALT suggestions generated.

Based on the ALT suggestions, I intend to incorporate scoring methods that could provide a determination of the teachers' ER competency based on the appropriateness of their ER strategy choices (ALT & EI 7 & 9). As I intend to score the teachers' ER competency during each context-bound experiential cycle, this continuously updated score could provide an indication of the experiential learning attainment (ALT & EI 11) and an indication of the intervention's effectiveness (ALT 12.1). For these purposes, an objective scoring method seemed most fitting. However, as my envisaged intervention will be integrated in real life, and the teachers are expected to respond to context-bound ER situations, objective scoring seemed ill-fitted. Gross (2015) argues that it is nearly impossible to specify whether a particular ER strategy is appropriate in an objective manner. As such, it seemed relevant to consider a contextually-sensitive scoring method to determine the teachers' ER competency. Neither consensus nor expert scoring seems to provide for contextual consideration and were therefore deemed irrelevant in their current form.

As reflected, existing scoring limitations rendered the decision on which scoring method to incorporate in my envisaged intervention problematic. I therefore turned to the literature for alleviating suggestions (MacCann, 2006; MacCann & Roberts, 2008; Peña-Sarrionandia et al., 2015; Sheppes et al., 2014). One suggestion seemed particularly promising in providing for contextually-sensitive scoring.

#### *3.4.2.7 Alleviating suggestions*

A potential suggestion to enhance contextual consideration is to focus on the regulatory goal(s) of the regulator (Peña-Sarrionandia et al., 2015). This means that an ER strategy might be deemed "contextually adaptive" if the outcome meets the regulatory goal(s) (refer to Figure 3.5) of the regulator (Peña-Sarrionandia et al., 2015, p. 2). If the goal of a teacher is to get a disruptive learner to start working, down-regulating his or her frustration by seeking help from the principal would be deemed contextually adaptive if it resulted in decreased frustration and



a working learner. Based on the ER process description (Figure 3.5, sub-process *d*) this involves the emotional and short-term situational outcome. The ER strategy's appropriateness is therefore scored regardless of the selected strategy's long-term adaptive value or implied social norms (Peña-Sarrionandia et al., 2015). This suggestion bears the potential for contextually-sensitive scoring that supports the ALT suggestions' scoring purposes described. As such, this suggestion provided the basis on which I proposed my conjectural decision.

### 3.4.2.8 Conjecture

The purpose of this sub-section is to practically describe my conjectural decision. This involves a discussion of how I attempted to alleviate existing scoring delimitations based on the suggestion described. In order to provide a relevant contribution to existing EI measurement practices, I furthermore reflect on the quality of my conjectural decisions taken in this sub-section. I subsequently updated the conjectural substantive heuristics visualised in Figure 3.7 (EI) to account for the decisions made within this sub-section.

Based on the alleviating suggestion described in the previous sub-section, and as described here, I decided to incorporate an adaptation of Peña-Sarrionandia et al.'s (2015) view of contextual adaptiveness. I adapted this view by including an observer's opinion, as well as the potential long-term outcome of particular ER strategy decisions. In Figure 3.6, I provide a schematic example of the envisaged scoring method, followed by a short description thereof.

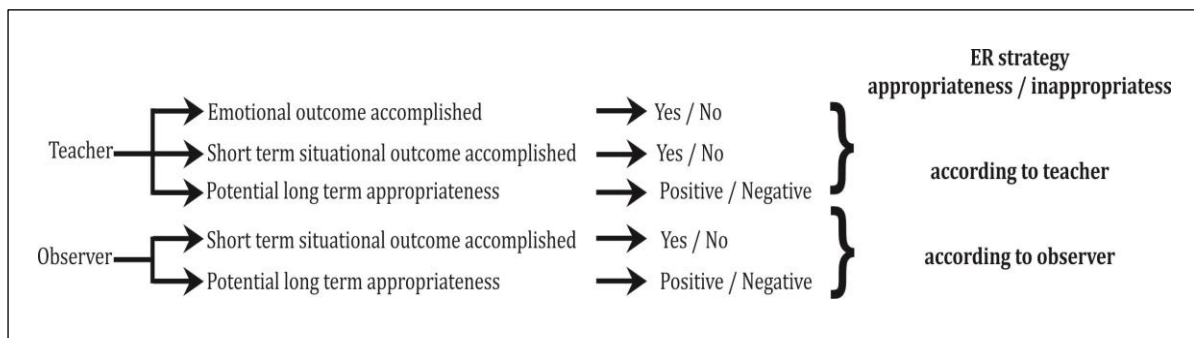


Figure 3.6: Contextually adaptive scoring method envisaged for my intervention

As indicated in Figure 3.6, the envisaged scoring method entails allowing a teacher and observer to report on the outcomes of the ER strategy employed, as experienced or witnessed. After reporting on their ER strategy selected, for example, ignoring a disruptive learner, a teacher would additionally report if the strategy accomplished their desired regulatory goals. This includes the emotional outcome, such as decreasing frustration, as well as the short-term situational outcome, such as getting a disruptive learner to work. Additionally, each teacher has to indicate if they thought their choice of ER strategy would have positive or negative long-term

consequences. Similarly, the observer will report on the short-term situational outcome witnessed, as well as the potential long-term consequences. Combined, the ER strategy is deemed contextually appropriate if all outcomes are positively rated (EI 9 & 11). In order to conjure and justify the meaningfulness of my scoring-related decisions discussed thus far, it is necessary to critically reflect on the quality thereof.

### ***Quality reflection***

As I reflected on the quality criteria of relevance, fairness and comprehensiveness during Phase 1 (refer to Sub-section 2.5.4, Chapter 2), my scoring-related conjectural decisions needed to provide a relevant contribution to existing EI scoring practices of teachers (Nieveen & Folmer, 2013; Plomp, 2013). I contended with my attempt to provide fair and comprehensive coverage of the actual defined content (Cohen et al., 2011; Edelson, 2006) discussed in Sub-section 3.4.1, and therefore reflected on the relevance of these decisions to teachers' contextualised needs, as well as to the ALT suggestions generated. Based on the notion that objective scoring of ER competence was deemed unsuitable (Gross, 2015), I focused my attention on incorporating a scoring method that allowed for the contextual consideration of actual ER occurrences. I particularly focused on addressing teachers' contextualised ER needs.

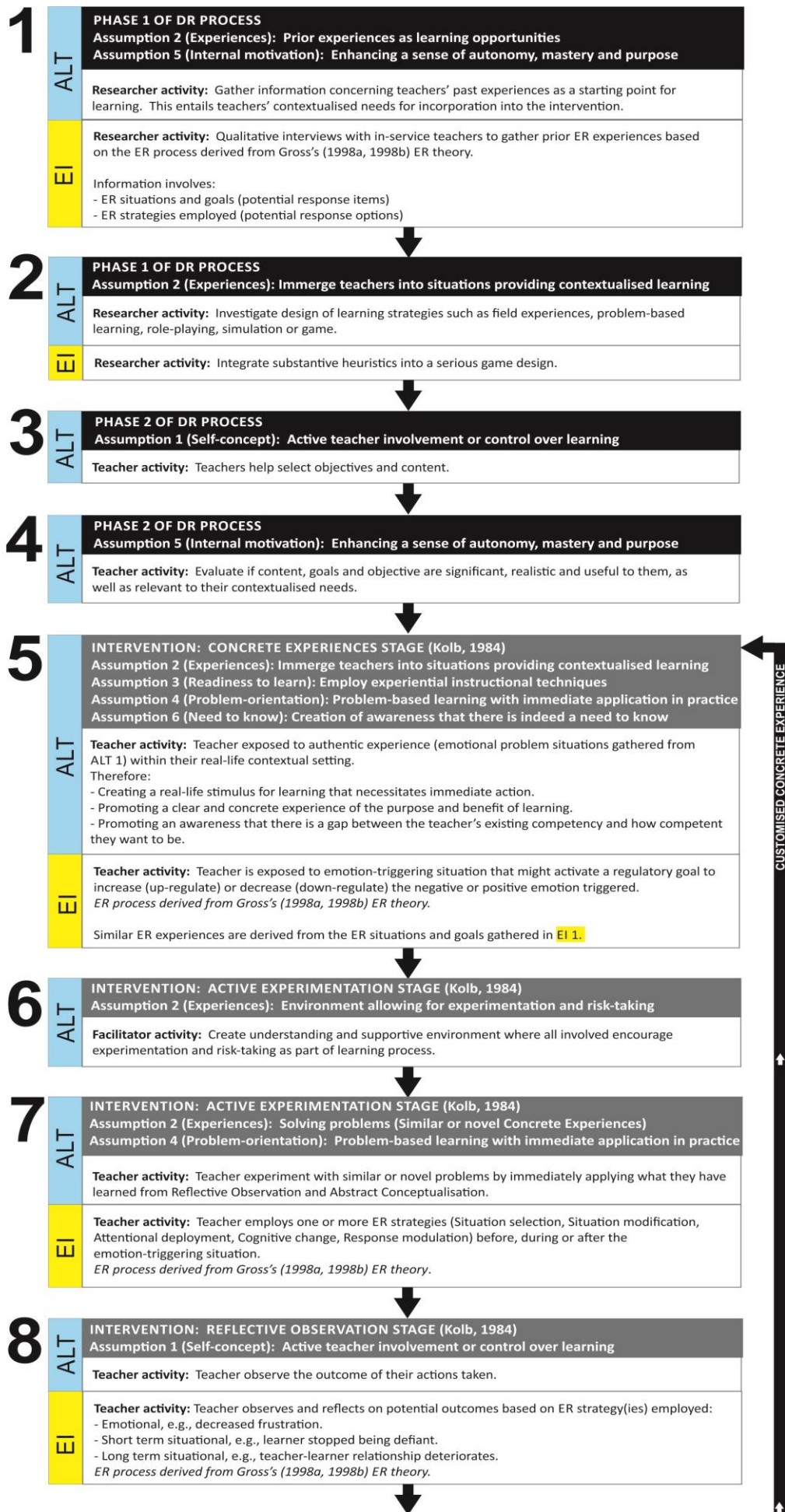
My conjectural decision supports a number of ALT suggestions. Firstly, the envisaged scoring allows for a method that could determine ER competency (ALT 11). Secondly, this scoring method allows for teachers to observe, reflect and report on the outcomes of their experimental attempts to solve particular problems (ALT 8 & 9). Thirdly, the scoring results provide the basis for collaborative online community discussions. Sharing insights, ideas, and stories about the ER experiences and their particular ER strategy choices, the teachers will be able to reflect critically on their own and others' ER strategies employed (ALT 12.2). In turn, critical reflection allows for abstract conceptualisation of what worked and why (ALT 9). Fourthly, this scoring method allows for real-time, technology-assisted information in the form of a progress report (ALT 12.1). This will be used for the purpose of teacher reflection, customising learning on the basis of teachers' contextualised ER needs, or as an indication of learning attainment.

I conclude this chapter by presenting the conjectural substantive heuristics. Grounded in the ALT suggestions, my reviews of the EI and ER literature provided further formation of the conjectural substantive heuristics. These heuristics comprise my conjectural decisions taken on the basis of providing a relevant contribution to current EI practices, in particular with regard to the contextualised ER needs of teachers.

### **3.5 CONJECTURAL SUBSTANTIVE HEURISTICS**

The concept ‘conjectural substantive heuristics’ refer to the prescriptive characteristics or ‘how to’ solution (Edelson, 2006; Plomp, 2013; Wang & Hannafin, 2005) of my envisaged intervention. These substantive heuristics constituted Cycle 1’s output (see Figure 3.1), which I formatively evaluated as described in Chapter 2. I present the conjectural substantive heuristics as activities planned for execution before and during my envisaged intervention. This identified the sequence of my envisaged activities in relation to each substantive heuristic and information source used.

In Figure 3.7, I present my conjectural substantive heuristics. Each heuristic is accompanied by an activity number. Numbers 1-4 represents activities I envisaged as part of my procedural framework. Particularly, two activities I conducted during Phase 1 of this study, and two activities I envisaged for Phase 2 of the second future study. Numbers 5-13 represents my envisaged intervention’s activities, which entails the participating teachers, observers, facilitator, and researcher’s actions during the course of the intervention. These activities (1-13) were generated from the ALT assumptions described in Section 3.3, and as such, forms the theoretical foundation of the heuristics. I subsequently based my EI and ER conjectural decisions described in Section 3.4 on the ALT activities generated. These information sources are visualised on the left of each activity, and referenced in this chapter as, for example, ALT 5 or EI 5.



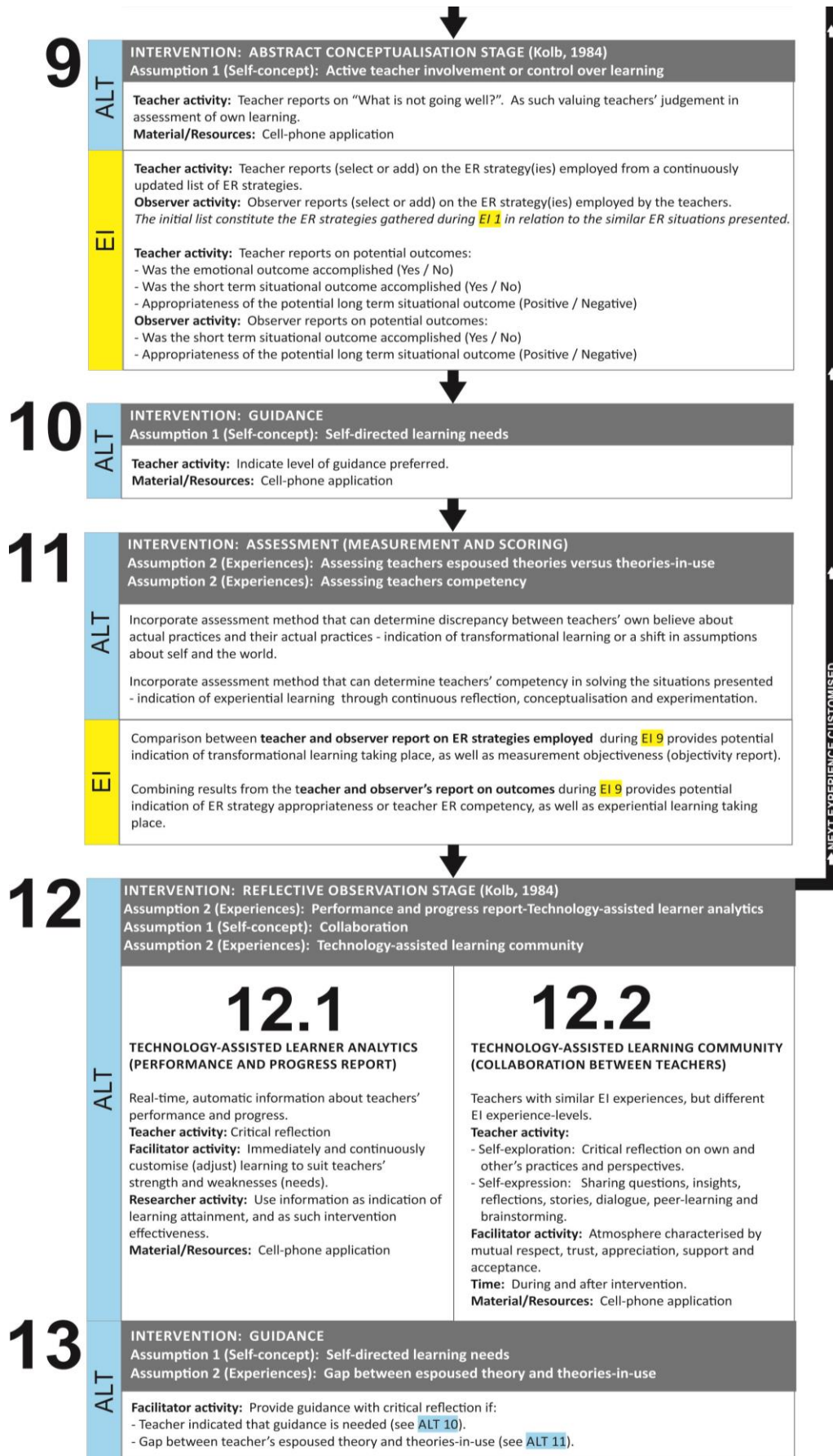


Figure 3.7: Conjectural substantive heuristics

In the next chapter, I describe the substantive refinements made during Cycles 2 and 3 of Phase 1 of my procedural framework, which were prompted by my conjectural substantive heuristics (ALT & EI 1 & 2). I conclude the next chapter with the conceptual first prototype in the form of a global design produced in Cycle 4.

# CHAPTER 4 REFINED SUBSTANTIVE HEURISTICS

## 4.1 INTRODUCTION

In this chapter, I introduce the refined substantive heuristics represented in Sub-section 4.5.1, Figure 4.5. The focus of this chapter is on the development of my conjectural substantive heuristics, which were generated from the ALT, EI and ER literature in Chapter 3 into the refined substantive heuristics. As such, understanding this chapter is dependent on the detail set out in Figure 4.5, which I cross-referenced based on its represented activities as substantive ALT, EI or Refined (e.g. 5) heuristics.

The refinements discussed in this chapter were prompted by two conjectural substantive decisions, as discussed in Chapter 3. The first decision represented in the substantive ALT and EI (1) heuristic involved the employment of teachers' own ER experiences as learning opportunities. The second decision represented in the substantive ALT and EI (2) heuristic involved the integration of the envisaged intervention into teachers' real life through the application of a serious game.

As such, two sources constituting Cycles 2 and 3, as visualised in Figure 4.1, informed the refinements made to the conjectural substantive heuristics grounded in ALT and informed by EI and ER literature during Cycle 1. Together, Cycles 1 to 3 allowed me to conceptualise my first prototype design in Cycle 4. This chapter constitutes Cycles 2, 3 and 4 of the procedural framework.

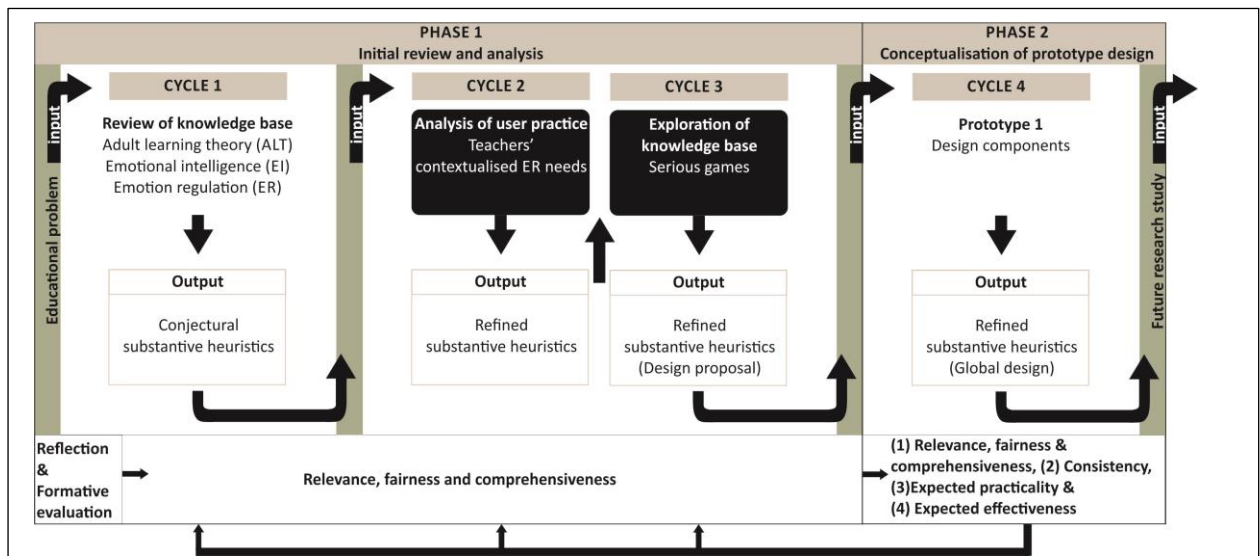


Figure 4.1: Procedural conceptual framework (adapted from Dowse & Howie, as cited in Plomp, 2013, p. 41)

As visualised in Figure 4.1, the first source I used to refine my substantive heuristics was an analysis of the teachers' contextualised ER needs, which was conducted during Cycle 2. This entailed a two-phased semi-structured interview with 16 in-service teachers, as described in Chapter 2. My intention with these interviews was to generate relevant, fair and comprehensive content based on teachers' expressed ER experiences as the basis for my envisaged intervention's training, measurement and scoring. Based on the ER process (Figure 3.5, Chapter 3) derived from Gross's (1998a, 1998b) ER theory, I gathered information about the authentic real-life, context-bound ER situations, goals and strategies experienced and employed by in-service teachers.

The second source that I used to refine my substantive heuristics was an exploration of selected serious game literature during Cycle 3. My intention with this exploration was to generate relevant, fair and comprehensive theoretical and practical serious game design strategies that might allow the effective application of my substantive heuristics. I explored a broad spectrum of existing serious game design approaches from which I selected one design's theoretical and practical design strategies to be embedded in my substantive heuristics.

Cycles 2 and 3 concluded Phase 1 of this study, and manifested in the refined substantive heuristics informed by teachers' expressed ER experiences and practices, as well as by selected literature on serious games design strategies. In design terms, Phase 1 produced the design proposal (Nieveen & Folmer, 2013) necessary for design the prototyping in Phase 2. This meant that I used Phase 1's design proposal to conceptualise the first prototype of an ER serious game for teachers in the form of a global design during Cycle 4, Phase 2. My global design constituted a brief description of the envisaged intervention's design components (Nieveen & Folmer, 2013) as derived from the refined substantive heuristics generated. In this chapter, I contributed to quality-orientated outputs during and after each cycle by employing activities related to particular quality criteria (Sub-section 2.5.4, Chapter 2).

In Section 4.2, I describe the quality-orientated activities and criteria that I employed. In Section 4.3, I describe the content derived from my analysis of teachers' contextualised ER needs. In Section 4.4, I discuss the selected serious game design strategies derived from my exploration of serious game literature. In Section 4.5, I describe each design component derived from the refined substantive heuristics generated, and which of these constitute the global design for an ER serious game for teachers.



## 4.2 QUALITY-ORIENTATED ACTIVITIES AND CRITERIA

To generate improvements (Thijs & Van den Akker, 2009) and subsequently guide the quality of Cycles 2-4, I once again conducted two quality-orientated activities, as visualised in Figure 4.2.

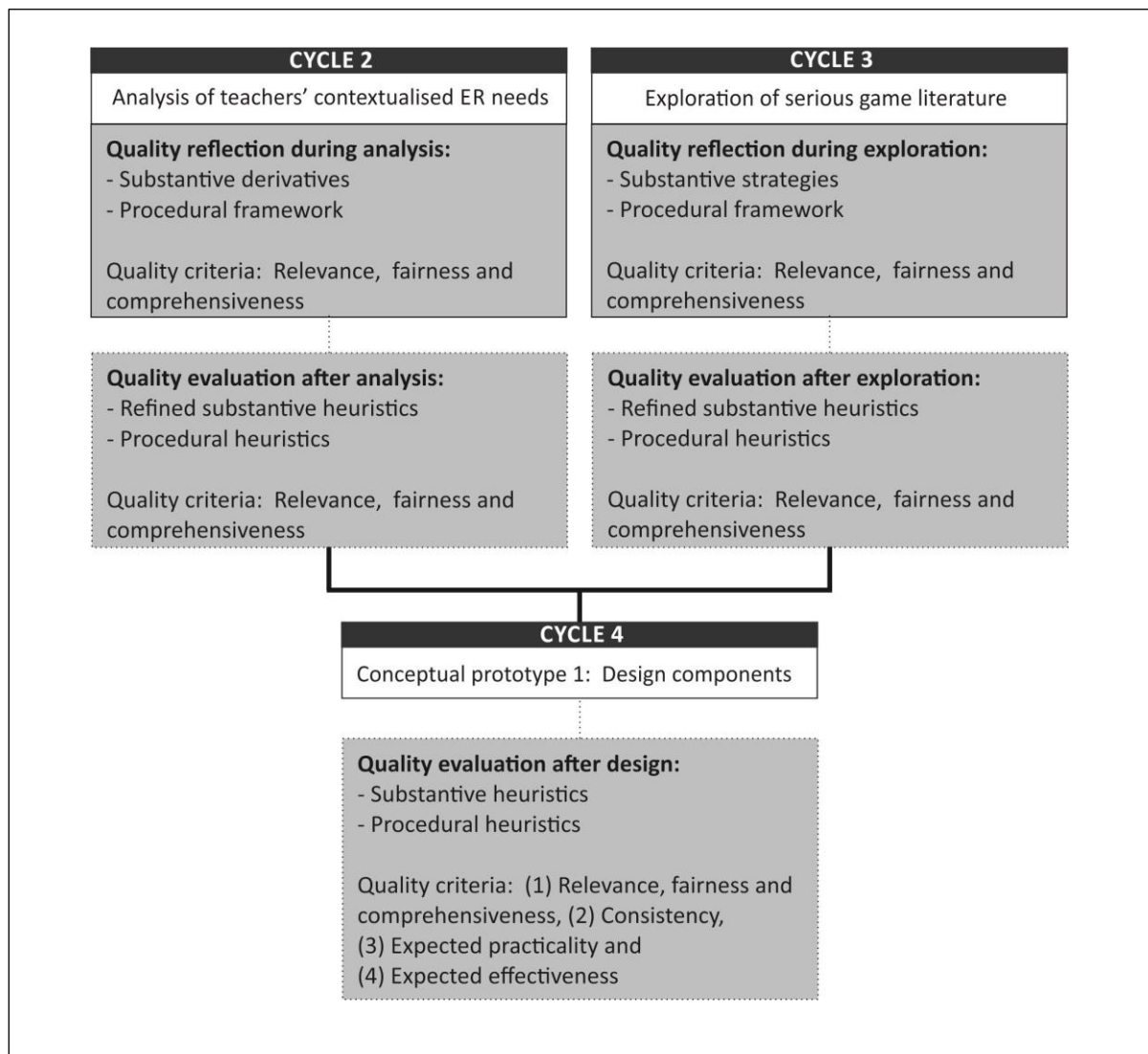


Figure 4.2: Quality-orientated activities conducted during and after Cycles 2, 3 and 4

The *first* quality-orientated activities that I conducted were to continuously reflect on the relevance, fairness and comprehensiveness of the refinements made during Cycle 2's analysis of teachers' ER needs and Cycle 3's exploration of serious game design strategies. I describe these quality reflections on the substantive refinements generated in this chapter. In particular, I aimed to determine:

1. If the analysis' derivatives and serious game design strategies were relevant to the teachers' contextualised ER needs, as well as to the substantive heuristics grounded in ALT.
2. If I covered state-of-the-art information from in-service teachers' expressed ER experiences and serious game literature in a fair and comprehensive manner.

In this way, I once again attempted to generate quality-orientated and refined substantive heuristics to be embedded in the global design. I furthermore determined if my procedural framework needed to be modified or improved to accommodate the refinements reflected on during Cycles 2 and 3.

The *second* quality-orientated activities that I conducted, which are described in Chapter 2, were to formatively evaluate Cycles 2-4's evolving substantive and procedural heuristics. I conducted screening checklists (Appendices A-D) involving checking off important component characteristics of the evolving intervention (Nieveen & Folmer, 2013). For the purpose of evaluating Cycles 2 and 3's heuristics, I focused on the quality criteria of relevance, fairness and comprehensiveness using the same checklist (Appendix A) as in Cycle 1. In an effort to account for typical and non-typical DR-specific threats (McKenney et al., 2006) to the heuristics' quality, I compiled a checklist (Appendix A) from existing educational research (e.g. Cohen et al., 2011) and DR literature (e.g. Plomp, 2013).

For the purpose of evaluating Cycle 4, I primarily attempted to establish and confirm the heuristics' (1) Relevance, fairness and comprehensiveness, and (2) Consistency. In addition, I considered the heuristics' (3) Expected practicality and (4) Expected effectiveness (Sub-section 2.5.4, Chapter 2). In an effort to account for the heuristics' relevance, fairness and comprehensiveness; I again conducted the associated checklist (Appendix A). To account for the heuristics' consistency, I compiled three checklists (Appendix B1-3) assisting me to compare the global design components' (1) Interconnectedness (Van den Akker, 2013), (2) Consistency with future-orientated design guidelines (Carl, 2012; Ornstein & Hunkins, 2014), and (3) Acceptable portrayal of underlying theory and in-service teachers' expressed experiences (Cohen et al., 2007, 2011). To account for the heuristics' expected practicality, I compiled a checklist (Appendix C) from the existing DR literature (e.g. Barab & Squire, 2004) focused on potential threats to practicality. To finally account for the heuristics' expected effectiveness, I used an existing checklist (Appendix D) compiled by Rowntree (as cited in Carl, 2012, p. 162) to determine existing interventions' effectiveness. In the remainder of this chapter, I discuss Cycle 2, 3 and 4 of my procedural framework (Figure 4.1).

### **4.3 ANALYSIS OF TEACHERS' CONTEXTUALISED ER NEEDS**

During Cycle 2 (Figure 4.1), my intention was to derive and generate relevant, fair and comprehensive content that is based on teachers' contextualised ER needs. As such, in this section I present the content derived from my qualitative inquiry into teachers' contextualised ER experiences and practices. This analysis was prompted by the substantive ALT and EI (1) heuristic to employ teachers' own ER experiences as learning opportunities; or as the content on which to base the training, measurement and scoring of my envisaged intervention. I concluded this section by reflecting on the quality of the analysis' derivatives, referring to my envisaged intervention's content as derived from the analysis conducted.

My qualitative inquiry involved the methodological research activities described in Sub-section 2.6.3 (Chapter 2). I conducted two rounds of semi-structured interviews with 16 teachers (referred to as P1, P2...) from two secondary rural, and two secondary urban schools. The interviews were conducted at a venue and time preferred by each participating teacher. I conducted an interim analysis between the two rounds of interviews, which provided the information used in my interview schedule during the second round of interviews. My first interview schedule (Appendix I) focused on gathering information about emotion-triggering situations and the ER goals experienced by the participating teachers. My second interview schedule (Appendix J) focused on gathering information about the ER strategies typically employed by the participating teachers in response to the situations and goals gathered during the first round of interviews.

I decided to base the content of my envisaged intervention on the ER process (Figure 3.5, Chapter 3) derived from Gross's (1998a, 1998b) ER theory. This meant that I intended to practically incorporate authentic emotion-triggering situations that might activate a regulatory goal to increase (up-regulate) or decrease (down-regulate) a negative or positive emotion triggered. In turn, I envisaged incorporating authentic ER strategies that the teachers seemed to employ to regulate their emotions, and that resulted in particular outcomes. Commencing with emotion-triggering situations, I hereafter describe each sub-process constituting the content of my envisaged intervention.

### 4.3.1 Emotion-triggering situations

The emotion-triggering situations experienced by the teachers refer to professional occurrences in or outside of the classroom that triggered particular emotions that teachers had to regulate. The emotion-triggering situations I extracted from the first interviews provided me with potential content within my envisaged intervention. In Table 4.1, I provide a list of the themes related to emotion triggers that the teachers recounted in the first set of interviews.

Table 4.1 List of emotion-triggering situations expressed by the participating teachers

Emotion triggered	Situational themes	
Negative emotions being triggered	Dire educational realities; Lack of organisational opportunities / support; Interpersonal conflict with learner/s; Inter-personal conflict with colleague/s; Unappreciative learners; Personal circumstances.	Nature of the profession; Feeling undervalued; Poor organisational communication/ effective decision making; Work overload; Home circumstances of learners.
Positive emotions being triggered	Making a difference; Teacher-student relationship; Organisational support; Learners' academic performance.	

As indicated in Table 4.1, the participating teachers' recounted emotion-triggering situations that they had experienced are listed. In Table 4.2, I provide an example of an emotion-triggering situation and its excerpt from an interview, whereas in Appendix L, I include all the situations that the participating teachers recalled having experienced.

Table 4.2: Example of emotion-triggering situation and excerpt as expressed by a participating teacher

Situation theme and description	Verified, generalised and adapted situation	Excerpt from interview with participant
<b>Inter-personal conflict with colleague/s:</b> While you wait for your contract to be finalised, the principal talks down to you and accuses you wrongfully.	You have just started teaching at your new school and your contract hasn't been finalised yet. While you love the profession and have a great relationship with the learners you are teaching, the headmaster is making life at school miserable for you.	P9: "...when I came back the deputy principal did not approach me in a good way, like we have two deputy principals, so remember the time that you called me I was on my way with my son, I came to report, and I even showed the deputy principal, the women, my son, how he was. So the other one, the male one, didn't see my son, so on Friday he met me at the passage and then said "Ha (recording unclear), you did not come to school on Thursday and Friday, and you did not report, why is that?" and I was surprised because I reported, and like, it didn't sit me well, because it is not the first time that something like that has happened, the manner in which he approach me, like even in terms of signing attendance register. Sometimes he will attack me and say "you did not sign the attendance register, why is that,

Situation theme and description	Verified, generalised and adapted situation	Excerpt from interview with participant
The headmaster talks to you in a way that feels that you are being attacked; he has wrongly accused you of not completing the attendance register in the mornings and has reprimanded you for being late when it wasn't the case at all. You feel saddened by the situation.		<p><i>why did you do that”, and I am like “but I did sign” and then I’ll go to the register and find that I signed the register...” (Appendix N, pp. 87 - 88, lines 86-108).</i></p> <p>P9: <i>“... saying that I don’t know what it is, but I think Mr X (name) is not treating me well, or the way in which he talks to me, it is like he is shouting at me like I am a child, he is not talking to me as if I’m an adult, so I don’t know what is going on, or I don’t know what is wrong what I’ve done, or maybe I made him angry of something and he is still angry about that thing, I don’t know, but I feel like every-time he talks to me he talks with anger, ja” (Appendix N, p. 88, lines 110-120).</i></p> <p>P9: <i>“I am still a temporary teacher, so you know, like, it is like, it is a culture, when you are temporary you are not allowed to express your views or your opinions, if you say something, then automatically they note it and say ‘ohh, we will get her, we will not renew his contract’ or so” (Appendix N, p. 88, lines 129-136).</i></p>

As indicated in Table 4.2, I generalised information extracted during the interviews, and in some instances adapted or disregarded particular situations. In this manner, I was able to ensure the anonymity of the participants. The situations extracted from the interviews were furthermore verified by the participants. Research (Thory, 2013) supports the situations extracted, as it indicates that managerial personnel, including educational managers, reported exposure to situations relating to interpersonal conflict, interpersonal interactions, organisational change, boredom, and work-overload.

The emotion-triggering situations described by the participants in the interviews provided me with potential content to be used in my envisaged intervention. I incorporated these situations within the envisaged intervention activity represented in the substantive ALT and EI (5) heuristic. I incorporated the situations gathered as potential emotion-triggering situations that could similarly be presented to the teachers participating in the envisaged intervention. This meant that I envisaged exposing the participating teachers to authentic situations, potentially activating ER goals within their real-life contextual setting.

### 4.3.2 ER goals

The ER goals experienced by the teachers refer to an emotional need to decrease (down-regulate), increase (up-regulate) or maintain a negative or positive emotion that was triggered by a particular situation. The ER goals that I obtained in the first interviews provided potential

content within my envisaged intervention. I extracted negative and positive emotions and four regulatory efforts. In Table 4.3, I provide a list of the ER goals obtained.

Table 4.3: List of ER goals expressed by the participating teachers

<b>Emotion triggered</b>	<b>Need to decrease the emotion</b>	<b>Need to increase the emotion</b>	
Negative emotions being triggered	Anger;	Hurt;	Anger;
	Apathy;	Irritation;	Frustration.
	Concern;	Distrust;	
	Despair;	Longing;	
	Disappointment;	Inferior or	
	Dispirited;	undervalued;	
	Doubt;	Regret;	
	Emotional exhaustion;	Rejected;	
	Fear;	Sadness;	
	Frustration;	Shame;	
	Guilt;	Strain;	
Heartbreak;	Stress;		
Helplessness.	Unappreciated;		
		Uncertain.	
Positive emotions being triggered		Care;	Joy/Enjoyment;
	Empathy.	Empathy;	Love;
		Enthusiasm;	Proudness;
		Fulfilment;	Satisfaction;
		Happiness;	Thankfulness.
		Hope.	

As indicated in Table 4.3, I represented the four ER goals distinguished by Gross’s (1998b, 2014) ER theory as pre-figured units of information, as well as listing the triggered emotions experienced by the teachers. I relied on occurrences in the raw data where a participant used words or phrases such as “decrease the anger”, “relieve the stress”, or “increase my enthusiasm” as demonstrative of an ER goal. Although I derived four ER goals from the interviews, I made the substantive decision to only consider situations and ER goals involving down-regulating or decreasing negative emotions as my envisaged intervention’s content. This decision is explained in Sub-section 4.3.4 as part of my quality reflection focused on relevance, fairness and comprehensiveness.

In Table 4.4, I provide an example of the four ER goals and excerpts from interviews, whereas Appendix L includes the four ER goals linked to the emotion-triggering situations expressed as being experienced by the participating teachers.

Table 4.4: ER goals and excerpts from the interviews as expressed by the participating teachers

ER goal	Excerpts from interviews with participants
Decreasing a negative emotion	P16: <i>"...I definitely have to decrease the doubt..."</i> (Appendix N, p. 145, line 140). P16: <i>"...make myself feel comfortable..."</i> (Appendix N, p. 153, lines 223-224).
Decreasing a positive emotion	P15: <i>"I can't maintain it (empathy), I just have to decrease it..."</i> (Appendix N, p. 143, lines 92-93).
Increasing a negative emotion	P13: <i>"I wanted them to see that I'm not very happy with what they've done, and then if they see how angry I am, maybe next time..."</i> (Appendix N, p. 116, lines 48-51). P13: <i>"...for the educators to understand how frustrated am I, cause if you just keep quiet, they will say 'ai, it is nothing'..."</i> (Appendix N, p. 118, lines 127-131).
Increasing (or maintaining) a positive emotion	P4: <i>"...the emotion empathy I would always want to increase in my life, I want to feel more of it..."</i> (as translated from Afrikaans, Appendix N, p. 25, lines 228-230). P4: <i>"...the fact that I plan maintains the feeling of satisfaction for me..."</i> (as translated from Afrikaans, Appendix N, p. 30, lines 410-411).

As indicated in Table 4.4, the participating teachers expressed experiencing all four regulatory goals visualised in the ER process derived from Gross's (1998a, 1998b) ER theory. In the majority of situations, the participating teachers reported the emotional need to decrease negative emotions, in particular anger and frustration. This derivative supports research (Sutton, 2004) indicating the most common regulatory goals of teachers as the down-regulation of anger and frustration. In Table 4.5, I provide an example of two emotions and excerpts from the interviews, whereas Appendix M includes all the emotions that the participating teachers recounted experiencing.

Table 4.5: Examples of emotions and excerpts from the participating teachers' interviews

Emotion (The American Heritage Dictionary of the English Language, 2018)	Excerpts from interviews with participants
Anger Definition: A strong feeling of displeasure or hostility.	P1: <i>"...come Sunday, we are very, very, very angry..."</i> (Appendix N, p. 1, lines 12-13).
Enthusiasm Definition: Great excitement for or interest in a subject or cause.	P14: <i>"...and I believe one should be enthusiastic..."</i> (as translated from Afrikaans, Appendix N, p. 122, lines 43-44).

Apart from the emotions indicated in Table 4.5, the participating teachers additionally expressed experiencing negative emotions being triggered such as frustration, disappointment, and shame; and positive emotions such as happiness, joy, pride and enthusiasm (refer to Appendix M). The emotions extracted support research (Gong et al., 2013) indicating that

teachers typically experience negative emotions such as anxiety, anger, frustration, disappointment, dissatisfaction, and shame; and positive emotions such as happiness, joy, pride, and enthusiasm.

The ER goals that I extracted from the interviews supported the emotion-triggering situations that can be similarly represented as content in my envisaged intervention. My incorporation of the ER goals extracted is therefore applicable to the substantive ALT and EI (5) heuristics. This meant that I envisaged exposing the participating teachers to authentic situations that might activate an ER goal. The teachers participating in the envisaged intervention may not, however, have experienced the emotional need to decrease the same emotions from exposure to the same emotion-triggering situation (Sutton, 2004). As such, I focused on the regulatory effort (e.g. to decrease a negative emotion), irrespective of the particular emotion.

Based on my substantive decision to only consider situations and ER goals involving the down-regulation of negative emotions, I continued with the second round of interviews with a specific purpose. This was to determine which ER strategies the teachers recalled employing to down-regulate the negative emotions triggered. I explain my decision in Sub-section 4.3.4.

### 4.3.3 ER strategies

The ER strategies employed by the teachers refer to what the teachers did to accomplish their desired ER goal(s) described in the previous sub-section. The ER strategies I extracted from the second interviews provided me with content in my envisaged intervention. I used the five ER strategies distinguished by Gross's (1998b, 2014) ER theory as pre-figured units of information. In Table 4.6, I provide an exemplary list of the ER strategies that I extracted.

Table 4.6: List of ER strategies expressed by the participating teachers

<b>ER strategies Gross (2014)</b>		<b>ER strategy examples</b>
Situation selection	Retire; Quit; Apply for another job.	Ask to be transferred; Avoid the situation; Excuse yourself from the job assigned to you.
Situation modification	Talk to learners/colleagues; Assist learners; Ask for help.	Make a plan; Use the discipline system; Talk to a higher authority or their parents.
Attentional deployment	Focus on eager learners; Ignore the situation; Concentrate on something else.	Focus on your work; Analyse the situation; Do introspection.
Cognitive change	Think differently about the situation; Accept the situation; Keep yourself motivated.	Do the best you can; Decide to be a role-model to learners; Let them learn from their mistakes.
Response	Unpack to a friend or counsellor;	Withdraw yourself;



<b>ER strategies Gross (2014)</b>		<b>ER strategy examples</b>
modulation	Take up a hobby; Exercise.	Act out aggressively; Use a substance.

As indicated in Table 4.6, I extracted the ER strategies that the participating teachers recounted employing, and represented the five ER strategies distinguished by Gross's (1998b, 2014) ER theory as pre-figured units of information. I relied on occurrences in the raw data where a participant used phrases such as "apply for another job", or "focus on your work" as being demonstrative of ER strategies.

In Table 4.7, I provide the five ER strategies and excerpts from the interviews linked to emotion-triggering situations and ER goals, as discussed by the participants. Appendix L includes a comprehensive overview of the ER strategies linked to the emotion-triggering situations expressed by the teachers. The five ER strategies furthermore encompassed a number of sub-strategies, which are elaborated on in Appendix K.

Table 4.7: ER strategies linked to emotion-triggering situations and ER goals, and excerpts from the interviews with the participants

<b>Emotion-triggering situations and ER goals</b>	<b>ER strategy description (Gross, 2014)</b>	<b>Excerpts from the interviews with the participants</b>
<p><b>ER situation:</b> Lack of understanding when grievances about learners' behaviour are raised with the authorities.</p> <p><b>ER goal:</b> Decreasing negative emotion/s (anger and hurt)</p>	<p><b>Situation selection:</b> An action taken to be in a situation with an expected emotion.</p>	<p>P14: "...I think I must apply for another job..." (as translated from Afrikaans, Appendix O, p. 377, lines 108-110). This respondent employed the sub-strategy of avoidance classified under situation selection.</p>
<p><b>Situation:</b> Overall desperate situation with regard to poverty-stricken communities and detached learners.</p> <p><b>ER goal:</b> Decreasing negative emotion/s (despondency derived from anger, stress, tiredness, strain, apathy, and being unappreciated)</p>	<p><b>Situation modification:</b> An action taken to modify the situation (or alter elements within one's external physical environment), therefore changing its emotional impact.</p>	<p>P6: "...Well, just to call their parents, and to show their parents what is good for their learners, and for the parents as well as a family." (Appendix O, p. 150, lines 27-30). This respondent employed the sub-strategy of direct situation modification classified under situation modification.</p>

Emotion-triggering situations and ER goals	ER strategy description (Gross, 2014)	Excerpts from the interviews with the participants
<p><b>Situation:</b> Arrogant learner pretending not to understand the most basic of work.</p> <p><b>ER goal:</b> Decreasing negative emotion/s (despair).</p>	<p><b>Attentional deployment:</b> Directing one's attention towards or away from a situation as to influence one's emotions. By selecting what we attend to we alter how we feel.</p>	<p>P3: "...ja, so you just leave them alone, then carry on with those who are eager to know" (Appendix O, p. 68, lines 96-98). This respondent employed the sub-strategy of distraction classified under attentional deployment.</p>
<p><b>Situation:</b> Overall desperate situation with regard to poverty-stricken communities and detached learners</p> <p><b>ER goal:</b> Decreasing negative emotion/s (despondency derived from anger, stress, tiredness, strain, apathy, and unappreciated).</p>	<p><b>Cognitive change:</b> The reappraisal of a situation to change its emotional significance or meaning in order to alter its emotional impact. Therefore, thinking differently about the situation or about one's capacity to manage the demands of the situation.</p>	<p>P1: "... but I should think since I started teaching I think my rewards are not actually in what I am getting paid, but at seeing change, even if it can be one learner out of the 80% of the learners, it fulfils me, it makes me proud, just like when you elicit response and then everybody seems confused and then one of them comes with the answer, then I feel so happy. Yes." (Appendix O, p. 2, lines 33-41). This respondent employed the sub-strategy of (re)appraisal classified under cognitive change.</p>
<p><b>Situation:</b> You need to take time off due to personal trauma at home. Your direct authority responded unsympathetically, declined your request for personal leave, and spoke about it in the staffroom. Now you have to discuss an urgent matter with this person again.</p> <p><b>ER goal:</b> Decreasing negative emotion/s (fear)</p>	<p><b>Response modulation:</b> Directly influencing or altering one's emotional response tendencies (experiential, physiological and/or behavioural) once they have been activated.</p>	<p>P11: "...I drink an extra relaxation pill ... yes ... yes" (as translated from Afrikaans, Appendix O, p. 310, lines 877-878). This respondent employed the sub-strategy of substance use classified under response modulation.</p>

As indicated in Table 4.7 and supported by the research (Sutton, 2004), the participating teachers expressed employing a variety of ER strategies to help them regulate their emotions. These strategies can be classified under the five ER strategies from Gross's (1998a, 1998b) ER theory.

The ER strategies that I obtained from the interviews provided the content on which I base the measurement and scoring within my envisaged intervention. My incorporation of the ER strategies gathered is applicable to the substantive ALT and EI (7, 8 & 9) heuristics. These ER strategies formed an initial list, which the teachers and observers furthermore will continuously update. This means that they will be able to add the ER strategies being employed or observed.

As such, I link each similar emotion-triggering situation presented to the participants with the initial list of ER strategies that they may use in the course of the intervention. In order to justify the meaningfulness of the analysis' derivatives discussed, I continuously reflected on the quality thereof.

#### **4.3.4 Quality reflection**

I reflected on the quality criteria of relevance during Phase 1 (refer to Sub-section 2.5.4, Chapter 2). As such, I reflected on the relevance, fairness and comprehensiveness of the analysis' derivatives to teachers' contextualised ER needs, and to the substantive heuristics grounded in ALT. I furthermore reflected on the coverage of state-of-the-art information obtained through the teachers' recounted ER experiences in a fair and comprehensive manner.

In order to contribute to the relevance of the content to the teachers' contextualised ER needs and to the substantive heuristics grounded in ALT, I decided to only focus on ER situations, goals and strategies representing the teachers' emotional need to down-regulate negative emotions. There were three reasons that governed my decision in terms of relevancy. Firstly, the research (Gong et al., 2013; Sutton, 2004) supported the analysis' derivatives by indicating that teachers' most significant need is to down-regulate negative emotions (refer to Sub-section 4.3.2). The decision to focus on the down-regulation of negative emotions secondly adheres to the substantive ALT (4) heuristic. This heuristic particularly pertained to my intervention's content being significant and useful to teachers. Thirdly, the analysis' derivatives indicated that the expressed ER experiences could be interpreted by the participating teachers with the greatest lucidity when the ER goals entailed the down-regulation of negative emotions. As an example, participant 15 indicated that she felt empathy for the learners not taking Grade 11 seriously, but that she needed to decrease the (positive) emotion in order for the learners to understand the importance of their school work (Appendix N, pp. 143-144, lines 88-103). The situation described might have equally activated an emotional need to decrease a negative emotion such as fear, disappointment, sadness or frustration amongst the teachers, meaning that the situation may have elicited different ER goals. The substantive ALT (5) heuristic was to provide clear and concrete ER experiences that would elicit the purpose and benefit of learning. In adhering to this heuristic, I therefore only included situations that necessitated the emotional need to down-regulate negative emotions.

I next reflected on the coverage of state-of-the-art information obtained through the teachers' expressed ER experiences in a fair and comprehensive manner. Cohen et al. (2007, 2011) indicate that if the comprehensive coverage of, for example, the participants' perspectives are not practical, the selected elements should be a fair representation of the wider perspective, and

the selected elements must be addressed in a comprehensive manner. Therefore, although I applied a limited sample, I aimed to represent the participating teachers' expressed ER experiences and practices in a fair and comprehensive manner (Cohen et al., 2007, 2011). I firstly attended to qualitative rigour in obtaining information from the teachers, as described in Sub-section 2.6.3 (Chapter 2). I secondly attempted to represent the participating teachers' expressed ER experiences and practices by comprehensively covering situations, goals and strategies related to the ER process (Figure 3.5, Chapter 3) as derived from Gross's (1998a, 1998b) ER theory. My analysis' derivatives thirdly concurred with the literature describing (Gross, 2015; Thory, 2013) and the research investigating (Gong et al., 2008; Sutton, 2004) the ER goals and strategies of in-service teachers.

In conclusion, the analysis' derivatives provided the means to design my envisaged intervention's content based on the ER process derived from Gross's (1998a, 1998b) ER theory, while also attending to teachers' contextualised ER needs and the substantive ALT (4 & 5) heuristics. I subsequently refined (5 & 9) my heuristics to account for the derivatives and decisions made within this section. In order to make effective decisions regarding serious game design, I explored the salient serious game literature.

#### **4.4 EXPLORATION OF THE SERIOUS GAME LITERATURE**

During Cycle 3 (Figure 4.1), my intention was furthermore to derive and generate relevant, fair and comprehensive theoretical and practical serious game design strategies derived from exploring serious game design literature. This meant presenting strategies for the design of a serious game that adhered to my substantive heuristics in such a way as to contribute to effective learning, measurement and scoring. I concluded this section by reflecting on the quality of the design strategies that I selected.

This exploration was prompted by the substantive ALT and EI (2) heuristic to integrate the intervention into teachers' real life through the application of a serious game. Apart from adhering to this particular heuristic generated, applying serious game design strategies additionally supported a number of the substantive ALT (1, 4, 5, 7, 11 & 12) heuristics, which increased the intervention's effectiveness (Shaffer & Gee, 2012; Shute & Ke, 2012; Spector, 2013). Serious game literature points to the salient design strategies that seemingly support:

- A learner-centred constructivist approach to learning (Garris et al., 2002).
- An all-encompassing scope for both analogue and digital game applications (Breuer & Bente, 2010).
- The application of knowledge to solve real world problems (Shaffer & Gee, 2012).

- Experimentation without real-world risks (Pivec, 2007).
- Increased engagement leading to intrinsic motivation during gameplay (Garris et al., 2002; Shute & Ke, 2012).

As such, I explored the theoretical and practical design strategies from a broad spectrum of existing serious game design approaches that I found relevant to my evolving substantive heuristics. This meant that I took the ALT, EI and ER literature, as well as my analysis of the teachers' contextualised ER needs into consideration. In order to discuss my selection and application of serious game design strategies, it is necessary to first provide an overview of what the collective term of serious games is, as well as what designing a serious game entails.

#### **4.4.1 Serious games**

Research on the games being played for learning, as opposed to fun (Breuer & Bente, 2010), is flourishing in various disciplines (McClarty et al., 2012). Currently, serious game authors (Breuer & Bente, 2010; Connolly et al., 2012; McClarty et al., 2012; Michael & Chen, 2006; Tobias et al., 2014) provide various definitions and typologies for games focused on learning. As such, the term serious games is one term out of a plethora of inconsistent terms used by authors to describe games providing the possibility for learning. These terms include, for example, entertainment education, game-based learning, edutainment games (Breuer & Bente, 2010), game-assisted learning (Wu et al., 2012), instructional games, and simulations (Garris et al., 2002). Breuer and Bente (2010, pp. 10-11) distinguish between different terms based on their application, and main or sole purpose.

As such, the term serious games provides an all-encompassing scope depicting an analogue and/or digital application for learning focused on education or additional purposes such as therapy, art or advertising (Breuer & Bente, 2010). Examples of the two applications of serious games include Lallie's (2015) analogue serious game for a university induction process, and Shute and Ventura's (2013) digital serious game for conceptual physics learning. Although the term serious game describes both analogue and digital applications, Sawyer has coined the term as a digital application in 2003 (Breuer & Bente, 2010). The definitions of serious games (Annetta, 2010) subsequently tend to reflect only digital or computer-based games. However, Arnab et al. (2014) explain that serious games should essentially be 'serious' and 'games'. This means that the game should establish transfer of learning whilst also remaining entertaining and engaging. The term serious games was first formulated by Abt in 1975 by combining the fun element of games with an explicit element of educational purpose. A commonly cited definition is "a game in which education ... is the primary goal, rather than entertainment" (Michael & Chen, 2006, p. 17). The concept of a simulation is also commonly used as a depiction of a serious

game (Garris et al., 2002), albeit the slight differentiation that a serious game includes game features such as score-keeping and challenges to be completed in order to advance in the game (Annetta, 2010; Garris et al., 2002; Sauvé et al., 2007).

In the context of this study, I refer to a serious game as a learning game that is used for the rationale of increasing teachers' ER in order to contribute to their EI. While scholars (McClarty et al., 2012) agree that serious games are favourable for learning and assessment, effectiveness depends on one's serious game design decisions (De Freitas & Routledge, 2013; Kiili, 2005a, 2005b).

#### **4.4.2 Serious game design**

Gunter, Kenny and Vick (2008, p. 514) define serious game design "as the formal methods utilised in the specification and planning of a game's content and features." This means that serious game design is primarily concerned with specific decisions relating to theoretical and practical underpinnings that might contribute to effective and suitable design components embedded in a serious game (Alghamdi & Li, 2013; De Freitas & Routledge, 2013). As such, I explored the theoretical and practical underpinnings of a broad spectrum of existing serious game design approaches (Amory, 2007; Arnab et al., 2014; De Freitas & Oliver, 2006; Garris et al., 2002; Gunter et al., 2008; Kiili, 2005a, 2006; Van Staaldunin & de Freitas, 2011; Wilson et al., 2009).

Serious game design approaches can be regarded as design directives informed by the best practices from existing serious games, as well as from theories on game- and instructional design (Van Staaldunin & de Freitas, 2011). Notable serious game design approaches propose a framework that can be replicated for effective serious game design or be used to analyse the effectiveness of an existing serious game (Van Staaldunin & de Freitas, 2011).

From my exploration of serious game design approaches, I specifically focused on theoretical and practical underpinnings (1) That concurred with or supported my substantive heuristics, or (2) That added additional value to my envisaged intervention, and as such, refined my substantive heuristics. I identified one serious game design approach, Kiili's (2005a, 2005b, 2006) experiential gaming model, containing such theoretical and practical underpinnings. The underpinnings embedded in Kiili's (2005a, 2005b, 2006) experiential gaming model concurred, supported and added additional value to the substantive ALT, EI and Refined (5-13) heuristics in the following manner:

- Kiili's model similarly represents constructivist experiential learning grounded in Kolb's (1984) experiential learning stages. This means that the model allows for

concrete experiences of context-bound ER problem situations that need to be solved through cycles of experimentation, reflection, and conceptualisation.

- Kiili similarly advocates for the incorporation of collaborative learning opportunities. This means that the model allows for teachers' critical reflection on own and other' perspectives on the ER strategies employed to solve the problem situations experienced within the intervention.
- Kiili's model similarly relies on internal motivation as an essential learning strategy. The model furthermore provides theoretically-grounded design strategies to create and sustain internal motivation during the intervention.
- Kiili similarly advocates for the incorporation of appropriate guidance as essential to effective learning. The model furthermore provides theoretically-grounded design strategies that contribute to an effective form of guidance during the intervention.
- Kiili similarly advocates for the incorporation of adaptations in order to customise learning to learners' individual needs. This means that the model allows for and provides theoretically-grounded design strategies to customise learning to teachers' individual ER needs.
- Kiili's model provides additional practical design strategies to minimise extraneous cognitive load<sup>4</sup> in analogue and digital applications of the game, and potentially deter optimal learning in the intervention.

In order to discuss my application of Kiili's theoretical and practical underpinnings, I first provide a compact overview of Kiili's (2005a, 2005b, 2006) experiential gaming model. As visualised in Figure 4.3, Kiili's (2005a) model relies on the basic nature of problem-based learning grounded in experiential learning.

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<sup>4</sup> Extraneous cognitive load refers to unnecessary information processing based on how the material is presented (Sweller et al., 1998).

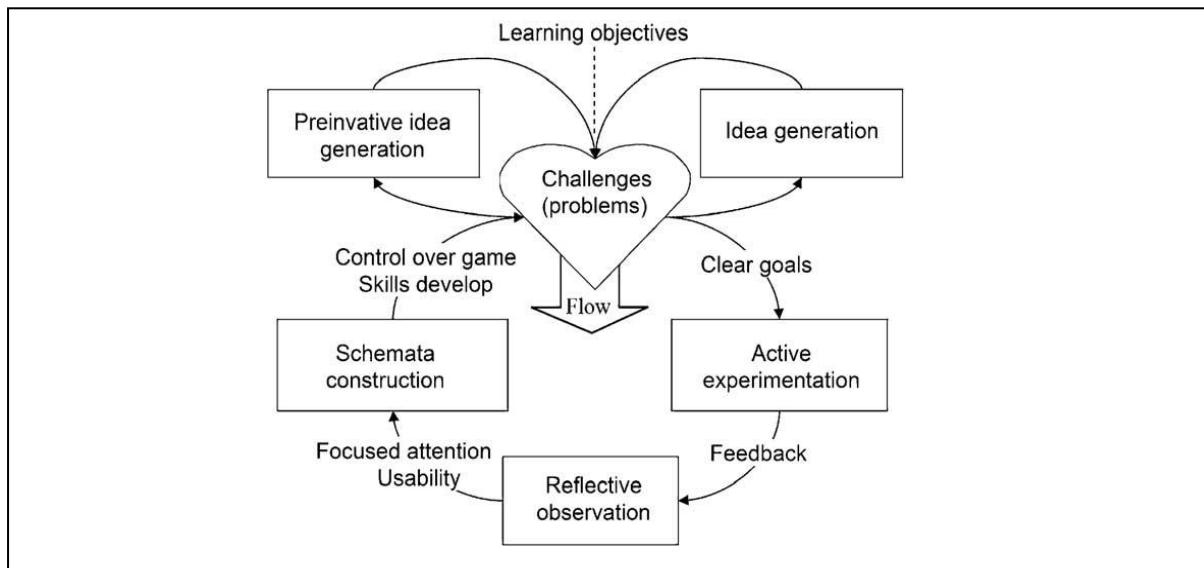


Figure 4.3: The experiential gaming model (Kiili, 2005a, p. 18)

Kiili's (2005a) experiential gaming model represents a cyclical process consisting of three parts: a challenge bank, an ideation loop, and an experience loop. The challenge bank metaphorically depicts a heart pumping out challenges linked to educational objectives which sustains a state of flow. A state of flow or flow experience is typically characterised by an intrinsically motivated state of mind, a heightened state of concentration (Annetta, 2010), complete absorption and engagement in the activity, loss of self-awareness, a feeling of time distortion, and an autotelic experience where doing the activity itself is the reward (Csikszentmihalyi, 1990; Garris et al., 2002; Kiili, 2005a, 2005b, 2006). A flow experience typically leads to increased learning (Csikszentmihalyi, 1990; Kiili, 2005b). Kiili (2005a) relies on Csikszentmihalyi's (1990) Flow Theory and associated flow research providing a number of flow antecedents to increase the likelihood of a flow experience. As visualised in Figure 4.3, the flow antecedents incorporated in Kiili's (2005a) model involve:

- Challenges matching the competency level of the learner;
- Clear goals;
- Appropriate feedback;
- Spontaneous gameplay focusing learners' attention; and
- A sense of control.

The ideation and experience loops metaphorically depict the blood-vascular system through which ideas are generated and experiential learning grounded in Kolb's (1984) learning stages are attained. This means that a cyclical process is activated by a particular challenge, which involves solution generation through an ideation loop and learning attainment through an



experience loop grounded in Kolb's (1984) experiential learning stages. The ideation loop is depicted as the upper heart-shaped loop within the visualised model (Figure 4.3), and the experiential loop as the bottom.

#### **4.4.3 Serious game design strategies**

In accordance with Figure's 4.3's visualisation, I herewith describe the theoretical and practical underpinnings that I incorporated from Kiili's (2005a) experiential gaming model. In particular, this means that I describe specific design strategies that concur, support or add additional value to my substantive heuristics. These design strategies are related to the following three theoretical and practical underpinnings embedded in Kiili's (2005a) model:

1. Ideation and experience loops.
2. Creation and sustainment of flow.
3. Minimising of extraneous cognitive load.

#### **Ideation and experience loops**

I herewith first present the design strategies incorporated in Kiili's (2005a) model's ideation and experience loops. I secondly describe how two of these design strategies concur with or support the substantive heuristics that represent my envisaged intervention's activities. I thirdly describe one design strategy that added additional value to my substantive heuristics, and how I applied it.

Kiili's (2005a) model incorporates the design strategy of Kolb's (1984) experiential learning stages as the predominant strategy for optimising learning within a game. Kolb's (1984) learning stages are represented in the experience loop visualised in Figure 4.3. Kiili's (2005a) model furthermore combines the design strategy of an ideation loop with Kolb's (1984) learning stages for optimising the creation of original and suitable problem-solving ideas within a game. Kiili (2007) finally incorporates the design strategy of exposing learners to context-bound, authentic and meaningful problem situations encountered in everyday life to contribute to the transfer of learning beyond the game (Annetta, 2010).

The strategy involving the incorporation of Kolb's (1984) experiential learning stages concurs with the substantive ALT and EI (5-9, 12) heuristics. This meant that my envisaged intervention entailed exposing teachers to concrete problem ER situations. They then had to attempt to overcome these by actively experimenting with various ER strategies (solutions) formulated through stages of reflective observation and the abstract conceptualisation of potential solutions. The design strategy involving the incorporation of context-bound, authentic and

meaningful problem situations equally concurred with the substantive ALT and EI (5) **heuristic**. This meant that my envisaged intervention included exposing teachers to authentic ER experiences derived from an analysis of their contextualised ER needs.

The design strategy involving combining an ideation loop with Kolb's (1984) experiential learning stages added additional value to my substantive heuristics. The purpose of Kiili's (2005a) model's ideation loop is to optimise the creation of original and suitable solutions to the problem situations presented to learners within a game. Kiili (2005a) describes this ideation loop as a collaborative (brainstorming) process within which ideas and solutions evolve from being unstructured or chaotic ideas to being original and suitable solutions. This means that learners in a game collaboratively generate new and better solutions to the problems presented while taking context-bound constraints and available resources into consideration (Finke, Ward & Smith, as cited in Kiili, 2005a).

I applied the design strategy of an ideation loop by refining the substantive ALT (12.2) heuristic that allowed for collaborative brainstorming between teachers to involve facilitator guidance with ideation. I therefore incorporated a facilitator activity into my envisaged intervention. This meant that my envisaged intervention was designed in such a manner that the facilitator would take part in the technology-assisted learning community by steering brainstorming between teachers from unstructured ideas to original and suitable solutions or potential ER strategies.

### **Creation and sustainment of flow**

I herewith first present the design strategy (flow antecedents) incorporated in Kiili's (2005a) model's creation and sustainment of flow. I secondly describe each flow antecedent incorporated in Kiili's (2005a) model. Depending on if the flow antecedent described concurred, supported or added additional value to my substantive heuristics representing my envisaged intervention's activities, I either describe (a) How the particular flow antecedent concurred with or supported my substantive heuristics, or (b) How I applied the particular flow antecedent that added additional value to my substantive heuristics.

Kiili's (2005a) model incorporates design strategy of flow antecedents that potentially create and sustain a flow experience. This optimises learners' intrinsic motivation, concentration, and engagement; and subsequently learning and exploratory behaviour in a game (Annetta, 2010; Csikszentmihalyi, 1990; Garris et al., 2002; Kiili, 2005a, 2005b, 2006). Kiili's (2005a) model incorporates the following flow antecedents as visualised in Figure 4.3:

1. Challenges matching the competency level of the learner.

2. Clear goals.
3. Feedback.
4. A sense of control.
5. Spontaneous gameplay focusing learners' attention.

The first flow antecedent (design strategy) incorporated in Kiili's (2005a) model involves matching the difficulty level of challenges presented to learners with their competency level within a game (Csikszentmihalyi, 1990). This means that learners' mental state potentially remains within a desired flow channel, as visualised in Figure 4.4.

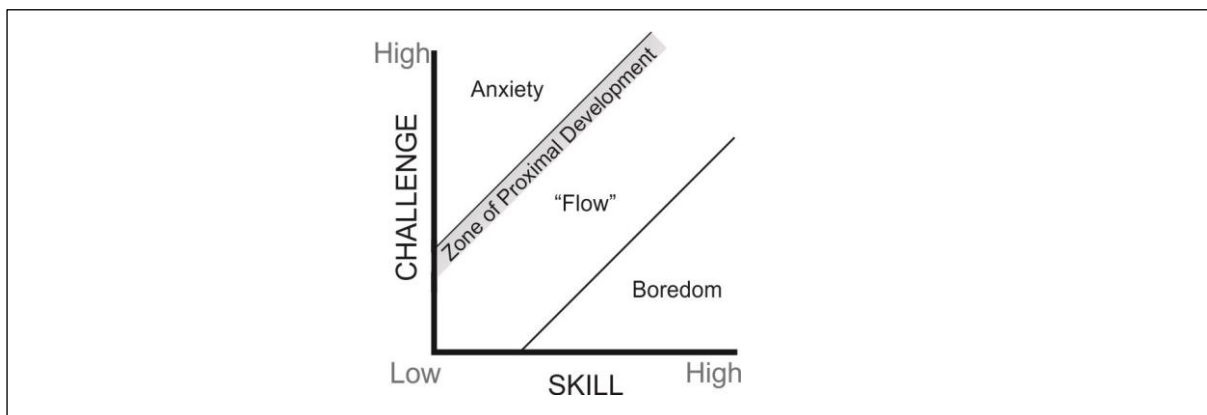


Figure 4.4: Three channel model of flow (Kiili, 2005a, p. 16)

As visualised in Figure 4.4, Kiili's (2005a) incorporation of this first flow antecedent might keep learners' mental state within a desired flow channel when their experience of a particular challenge lies in the centre of a continuum between being too challenging and not being challenging enough (Csikszentmihalyi, 1990; Kiili, 2005b, 2006; Malone, 1981). Gee (2005, p. 36) describes such a position as experiencing a mental state of "pleasurable frustration". This means that learners' mental state remains between boredom on one extreme and anxiety on the other extreme. Keeping the difficulty level of the challenges presented to learners in a game within the desired flow channel can be achieved by either (1) Increasing the difficulty level of the challenges, or (2) Decreasing the difficulty level of challenges through the provision of guidance (Malone, 1981; Malone & Lepper, 1987; Moser, 2000). As visualised in Figure 4.4, Kiili (2005a) regards the optimal time for the provision of guidance as hovering "at the boundary of a student's competence" where it requires the minimum support to achieve more than their independent ability allows for (Shute et al., 2011, p. 1). This position is supported by Vygotsky's (1978) Zone of Proximal Development (ZPD). The ZPD represents the gap between what a learner can do without assistance, and what they can do only with assistance (Vygotsky, 1978).

The first flow antecedent involving matching the difficulty level of challenges presented to learners with their competency level in a game added additional value to my substantive heuristics. This meant that the incorporation of this flow antecedent had the potential to strengthen the teachers' internal motivation, concentration and engagement in my envisaged intervention (Annetta, 2010; Csikszentmihalyi, 1990; Garris et al., 2002; Kiili, 2005a, 2005b, 2006). I applied this flow antecedent by refining a number of substantive heuristics. In order to match the difficulty level of ER problem situations with the ER competency level of teachers within the intervention, I had to consider:

- How to link each ER problem situation to a specific difficulty level, and each difficulty level to a specific ER competency level of teachers;
- How to increase the difficulty level of each ER problem situation presented within the intervention; and
- How to decrease the difficulty level of each ER problem situation presented within the intervention.

In order to link ER situations with difficulty and competency levels, I decided to refine the substantive ALT (3) heuristic. This ALT heuristic allowed for in-service teachers input in the interventions' objectives and content during Phase 2 of my procedural framework, and the future second study related to this research project. I therefore included the in-service teachers' input in the decisions regarding the difficulty levels of their ER problem situations, as well as the ER competency levels required to accomplish the various difficulty levels of the ER problem situations.

In order to increase the difficulty level of the ER situations presented, I decided to refine the substantive ALT (10 & 12.1) heuristics. The substantive ALT (10) heuristic allowed for teacher input during the intervention. The substantive ALT (12.1) heuristic allowed for technology-assisted real-time information about the teachers' ER performance and progress used by the facilitator to customise (adjust) learning to suit the teachers' ER strengths and weaknesses. I refined these heuristics by including the facilitators' responsibilities and the decision to increase the difficulty level of the ER problem situations presented to the teachers. This meant that the facilitators increased the difficulty level of the next ER situation presented when the teachers (a) Performed consistently competently based on their continuously measured ER competency score, or (b) Indicated that they found the difficulty level of ER situations too achievable.

In order to decrease the difficulty level of the ER situations presented, I decided to refine the substantive ALT (10 & 13) heuristics. The substantive ALT (10) heuristics allowed for teacher input during the intervention. The substantive ALT (13) heuristic allowed for facilitator guidance with the teachers' critical reflection on their own performance. I refined these heuristics by including the provision of guidance by the facilitator when the teachers (a) Perform consistently incompetently based on their continuously measured ER competency score, or (b) Indicated that they found the difficulty level of the ER situations too challenging.

*The second flow antecedent (design strategy)* incorporated in Kiili's (2005a) model involves exposing learners to clear and personally meaningful goals that provide a strong sense of what is expected from the learner in a game (Csikszentmihalyi, 1990; Kiili, 2005b, 2006; Malone, 1981). The second flow antecedent supports the substantive ALT (4) heuristic. This heuristic includes in-service teachers' evaluation of the intervention's goals as being significant, realistic, useful and relevant to them during Phase 2 of my procedural framework, and the future second study related to this research project.

*The third flow antecedent (design strategy)* incorporated in Kiili's (2005a) model involves the provision of feedback during gameplay. This flow antecedent supports the substantive ALT (12.1) heuristic involving technology-assisted, real-time learner analytics about teachers' ER performance and progress in the intervention.

*The fourth flow antecedent (design strategy)* incorporated in Kiili's (2005a) model involves providing learners with a sense of control, meaning that they believe that they can succeed in the game and subsequently the subject matter (Csikszentmihalyi, 1990; Kiili, 2005b, 2006). Malone and Lepper (1987) and Moser (2000) recommend allowing learners to regulate the difficulty levels of the challenges presented to them as it contributes to their sense of control. This flow antecedent supports the substantive ALT (3, 8 & 9) heuristics involving valuing teachers' input and judgement, which contributes to the ALT assumption of self-directed learning. Malone and Lepper (1987) and Moser's (2000) recommendation furthermore supports the substantive Refined (10) heuristic involving teachers' own input regarding the difficulty levels of the ER situations presented to them.

*The fifth flow antecedent (design strategy)* incorporated in Kiili's (2005a) model involves the provision of spontaneous and automatic gameplay (Csikszentmihalyi, 1990; Kiili, 2005b, 2006). Kiili (2005a) indicates that this antecedent coincides with Kolb's (1984) experiential stages as it provides for sequential and continuous cycles of action, reflection and feedback (Kiili, 2005a, 2005b; Kolb, 1984; Kolb et al., 2000). As such, this flow antecedent concurs with the substantive

ALT and EI (5-9, 12) heuristics involving Kolb's (1984) experiential learning stages. These contribute to the continuous cycles of action, reflection and feedback within my envisaged intervention.

### **Minimising extraneous cognitive load**

I herewith first present the design strategies incorporated in Kiili's (2005a) model aimed at minimising extraneous cognitive load. I secondly describe the design strategies that I expected to add additional value to my substantive heuristics, and how I intended to apply these.

Kiili's (2005a) model suggests design strategies aiming to minimise extraneous cognitive load to optimise learning and problem-solving within a game (Kiili, 2005b; Sweller, 1994; Sweller et al., 1998). Cognitive load refers to the working memory's limited capacity for information processing. This is needed to accomplish the construction of cognitive structures to be incorporated in the learner's long-term memory (Sweller, 1994; Sweller et al., 1998). As such, extraneous cognitive load refers to unnecessary information processing based on how the material is being presented (Sweller et al., 1998). Kiili's (2005a) model incorporates practical strategies for combatting extraneous cognitive load within analogue and digital applications. For analogue applications, Kiili (2005a) incorporates the strategies provided by Sweller (1994) and Sweller et al.'s (1998) Cognitive Load Theory. For digital or multi-media applications, Kiili (2005a, 2006) incorporates the strategies provided by Mayer and Moreno (2002).

I expected the use of these design strategies minimising extraneous cognitive load in analogue and digital applications to add additional value to my substantive heuristics relying on both analogue and digital applications. This meant that in order to decrease the unnecessary or irrelevant information processing of teachers engaging in this intervention, I considered incorporating strategies to compensate for extraneous cognitive load that might impede teachers' problem solving and learning (Kiili, 2005b; Sweller, 1994; Sweller et al., 1998).

I considered applying the design strategies for analogue applications by refining the substantive ALT and EI (5) heuristic involving exposing teachers to real-life ER problem situations. This meant that I considered Sweller (1994) and Sweller et al.'s (1998) guidelines in the manner in which I presented the ER problem situations to the participating teachers. I furthermore considered applying the design strategies for digital applications by refining the substantive ALT & EI (9, 10 & 12) heuristics involving technology-assisted (digital) reporting, analytics and collaboration. This meant that I considered Mayer and Moreno's (2002) guidelines in the manner in which I presented the digital user-faces of the technology-assisted applications. In

order to justify the meaningfulness of the theoretical and practical design strategies discussed, I continuously reflected on the quality thereof.

#### **4.4.4 Quality reflection**

I reflected on the quality criteria of relevance, fairness and comprehensiveness during Phase 1 (refer to Sub-section 2.5.4, Chapter 2). As such, I reflected on the relevance of the selected serious game design strategies to teachers' contextualised ER needs, and to the substantive heuristics grounded in ALT. I furthermore reflected on the coverage of state-of-the-art information from the serious game literature in a fair and comprehensive manner.

In order to contribute to the relevance to the teachers' contextualised ER needs and to the substantive heuristics grounded in ALT, I specifically decided to incorporate the theoretical and practical underpinnings from Kiili's (2005a, 2005b, 2006) Experiential Gaming Model. Kiili's model concurred, supported and added additional value to the substantive ALT, EI and Refined (5-13) heuristics in the manner listed in Sub-section 4.4.2. As I refined my substantive heuristics by incorporating the design strategies adding additional value, I simultaneously fine-tuned the heuristics to the teachers' contextualised ER needs. I drew this conclusion from the notion that the purpose of serious game design strategies is to maximise end-user learning attainment, while simultaneously providing for a fun and engaging experience (Annetta, 2010; Arnab et al., 2014; McClarty et al., 2012).

I next reflected on the selected design strategies' coverage of state-of-the-art information from serious game literature in a fair and comprehensive manner. I decided to focus my attention on Kiili's (2005a, 2005b, 2006) serious game design approach after exploring a broad spectrum of existing approaches (e.g. Amory, 2007; De Freitas & Oliver, 2006). Although adhering to one approach limited my coverage of potential design strategies, I attempted to cover the strategies presented in Kiili's (2005a) Experiential Gaming Model in a fair and comprehensive manner (Cohen et al., 2007, 2011). The design strategies provided in Kiili's (2005a) model concur with the most common theoretical and practical underpinnings from serious game design approaches. I drew this conclusion based on Rooney's (2012) triadic framework. Rooney (2012) summarises the common underpinnings in serious game design literature. This involves (1) An immersed experience, (2) Theoretical soundness, and (3) A representation of actual events with a degree of fidelity (De Freitas & Routledge, 2013; Rooney, 2012). Concurrently, Kiili's (2005a) model provides for flow antecedents contributing to an immersed experience (Csikszentmihalyi, 1990); experiential learning (Kolb, 1984), contributing to theoretical soundness; and the minimising of extraneous cognitive load (Sweller et al., 1998), contributing

to fidelity. In this manner I aimed to provide comprehensive and fair coverage of the serious game design strategies to be incorporated in my envisaged intervention.

As visualised in Figure 4.1, Cycles 2 and 3 concluded Phase 1 of this study, which manifested as a set of refined substantive heuristics constituting a design proposal (Nieveen & Folmer, 2013). Phase 1's design proposal subsequently allowed me to conceptualise the first prototype of an ER serious game for the teachers during Phase 2, the prototype design phase of my study.

## **4.5 CONCEPTUAL DESIGN OF PROTOTYPE 1**

During Cycle 4 (Figure 4.1), my intention was to provide a brief description of the envisaged intervention's design components (Nieveen & Folmer, 2013) that I had derived from the refined substantive heuristics generated. I therefore use the term 'global design' to indicate my envisaged ER serious game, which encompasses (1) The refined substantive heuristics, and (2) Descriptive design components that I derived from my heuristics.

To guide the quality of the envisaged intervention, I formatively evaluated the global design by attempting to primarily establish and confirm its (1) relevancy, fairness and comprehensiveness, and (2) Consistency. In addition, I considered the global design's (3) Expected practicality and (4) Expected effectiveness (refer to Sub-section 4.2). I describe this formative evaluation activity in Chapter 2, and in detail in my Field Notes (Appendix P).

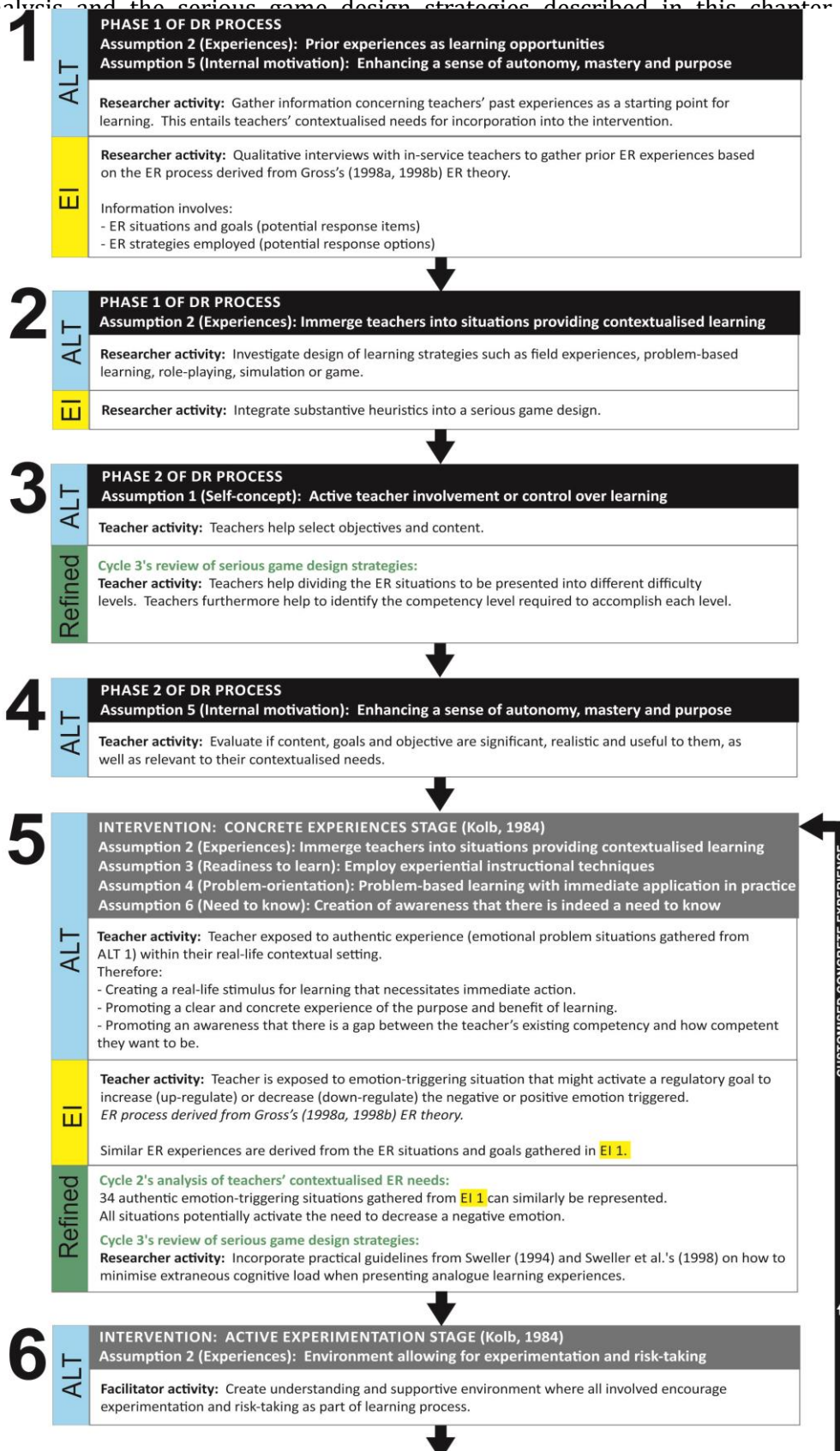
### **4.5.1 Refined substantive heuristics**

The concept 'refined substantive heuristics' refers to the prescriptive characteristics or 'how to' solution (Edelson, 2006; Plomp, 2013; Wang & Hannafin, 2005) of my envisaged intervention. I present the substantive heuristics as activities planned for execution before and during my envisaged intervention. This identified the sequence of my envisaged activities in relation to each substantive heuristic and information source used. This provides an overarching view of how I translated the evolving substantive heuristics into potentially practical and effective ER serious game activities.

In Figure 4.5, I present my substantive heuristics. Each heuristic is accompanied by an activity number. Numbers 1-4 represent activities that I envisaged as part of my procedural framework. This particularly encompassed two activities that I conducted during Phase 1 of this study, and two activities that I envisaged for Phase 2 of the second future study. Numbers 5-13 represent my envisaged intervention's activities, which entail the participating teachers, observers, a facilitator, and the researcher's actions during the course of the intervention. These activities (1-13) were generated from the ALT assumptions described in Section 3.3 (Chapter 3), and form



the theoretical foundation of the heuristics. I subsequently based my EI and ER conjectural decisions, as described in Section 3.4 (Chapter 3), on the ALT activities generated. I finally refined the heuristics generated from ALT, EI and ER from the derivatives gained from Cycles 2 and 3 analysis and the serious game design strategies described in this chapter. These inform



**7**

**INTERVENTION: ACTIVE EXPERIMENTATION STAGE (Kolb, 1984)**  
 Assumption 2 (Experiences): Solving problems (Similar or novel Concrete Experiences)  
 Assumption 4 (Problem-orientation): Problem-based learning with immediate application in practice

**ALT**

**Teacher activity:** Teacher experiment with similar or novel problems by immediately applying what they have learned from Reflective Observation and Abstract Conceptualisation.

**EI**

**Teacher activity:** Teacher employs one or more ER strategies (Situation selection, Situation modification, Attentional deployment, Cognitive change, Response modulation) before, during or after the emotion-triggering situation.  
*ER process derived from Gross's (1998a, 1998b) ER theory.*

**8**

**INTERVENTION: REFLECTIVE OBSERVATION STAGE (Kolb, 1984)**  
 Assumption 1 (Self-concept): Active teacher involvement or control over learning

**ALT**

**Teacher activity:** Teacher observe the outcome of their actions taken.

**EI**

**Teacher activity:** Teacher observes and reflects on potential outcomes based on ER strategy(ies) employed:  
 - Emotional, e.g., decreased frustration.  
 - Short term situational, e.g., learner stopped being defiant.  
 - Long term situational, e.g., teacher-learner relationship deteriorates.  
*ER process derived from Gross's (1998a, 1998b) ER theory.*

**9**

**INTERVENTION: ABSTRACT CONCEPTUALISATION STAGE (Kolb, 1984)**  
 Assumption 1 (Self-concept): Active teacher involvement or control over learning

**ALT**

**Teacher activity:** Teacher reports on "What is not going well?". As such valuing teachers' judgement in assessment of own learning.  
**Material/Resources:** Cell-phone application

**EI**

**Teacher activity:** Teacher reports (select or add) on the ER strategy(ies) employed from a continuously updated list of ER strategies.  
**Observer activity:** Observer reports (select or add) on the ER strategy(ies) employed by the teachers.  
*The initial list constitute the ER strategies gathered during **EI 1** in relation to the similar ER situations presented.*

**Teacher activity:** Teacher reports on potential outcomes:  
 - Was the emotional outcome accomplished (Yes / No)  
 - Was the short term situational outcome accomplished (Yes / No)  
 - Appropriateness of the potential long term situational outcome (Positive / Negative)  
**Observer activity:** Observer reports on potential outcomes:  
 - Was the short term situational outcome accomplished (Yes / No)  
 - Appropriateness of the potential long term situational outcome (Positive / Negative)

**Refined**

**Cycle 2's analysis of teachers' contextualised ER needs:**  
 ER strategies gathered from in-service teachers provide potential response options to be similarly represented as an initial list for teacher and observer selection.  
 The initial list of ER strategies is continuously updated by teachers and observers adding ER strategies being employed or observed.

**Cycle 3's review of serious game design strategies:**  
**Researcher activity:** Incorporate practical guidelines from Mayer and Moreno's (2002) on how to minimise extraneous cognitive load when presenting digital material.

**10**

**INTERVENTION: GUIDANCE**  
 Assumption 1 (Self-concept): Self-directed learning needs

**ALT**

**Teacher activity:** Indicate level of guidance preferred.  
**Material/Resources:** Cell-phone application

**Refined**

**Cycle 3's review of serious game design strategies:**  
**Teacher activity:** Teachers indicate if the difficulty level of the ER situation presented is too challenging, or too achievable.  
**Researcher activity:** Incorporate practical guidelines from Mayer and Moreno's (2002) on how to minimise extraneous cognitive load when presenting digital material.

**11**

**INTERVENTION: ASSESSMENT (MEASUREMENT AND SCORING)**  
 Assumption 2 (Experiences): Assessing teachers espoused theories versus theories-in-use  
 Assumption 2 (Experiences): Assessing teachers competency

**ALT**

Incorporate assessment method that can determine discrepancy between teachers' own believe about actual practices and their actual practices - indication of transformational learning or a shift in assumptions about self and the world.

Incorporate assessment method that can determine teachers' competency in solving the situations presented - indication of experiential learning through continuous reflection, conceptualisation and experimentation.

**EI**

Comparison between **teacher and observer report on ER strategies employed** during **EI 9** provides potential indication of transformational learning taking place, as well as measurement objectiveness (objectivity report).

Combining results from the **teacher and observer's report on outcomes** during **EI 9** provides potential indication of ER strategy appropriateness or teacher ER competency, as well as experiential learning taking place.

NEXT EXPERIENCE CUSTOMISED

12	<b>INTERVENTION: REFLECTIVE OBSERVATION STAGE (Kolb, 1984)</b> Assumption 2 (Experiences): Performance and progress report-Technology-assisted learner analytics Assumption 1 (Self-concept): Collaboration Assumption 2 (Experiences): Technology-assisted learning community	
	<b>12.1</b> <b>TECHNOLOGY-ASSISTED LEARNER ANALYTICS (PERFORMANCE AND PROGRESS REPORT)</b> Real-time, automatic information about teachers' performance and progress. <b>Teacher activity:</b> Critical reflection <b>Facilitator activity:</b> Immediately and continuously customise (adjust) learning to suit teachers' strength and weaknesses (needs). <b>Researcher activity:</b> Use information as indication of learning attainment, and as such intervention effectiveness. <b>Material/Resources:</b> Cell-phone application	<b>12.2</b> <b>TECHNOLOGY-ASSISTED LEARNING COMMUNITY (COLLABORATION BETWEEN TEACHERS)</b> Teachers with similar EI experiences, but different EI experience-levels. <b>Teacher activity:</b> - Self-exploration: Critical reflection on own and other's practices and perspectives. - Self-expression: Sharing questions, insights, reflections, stories, dialogue, peer-learning and brainstorming. <b>Facilitator activity:</b> Atmosphere characterised by mutual respect, trust, appreciation, support and acceptance. <b>Time:</b> During and after intervention. <b>Material/Resources:</b> Cell-phone application
ALT		
	<b>Cycle 3's review of serious game design solutions:</b> <b>Facilitator activity:</b> Customise (adapt) learning by increasing difficulty level of ER situation next presented to a teacher. Facilitator increases the difficulty level of ER situations when teachers are not within the desired flow channel.  This means that the facilitator increases the difficulty level when: - The teacher performs consistently competent. - The teacher indicates that they find the difficulty level too achievable (reported during <b>Refined 10</b> ). <b>Researcher activity:</b> Incorporate practical guidelines from Mayer and Moreno's (2002) on how to minimise extraneous cognitive load when presenting digital material.	<b>Cycle 3's review of serious game design strategies:</b> <b>Facilitator activity:</b> Facilitator guides collaborative idea generation from unstructured ideas to original and suitable solutions taking context-bound constraints and available resources into consideration.  <b>Researcher activity:</b> Incorporate practical guidelines from Mayer and Moreno's (2002) on how to minimise extraneous cognitive load when presenting digital material.
Refined		
13	<b>INTERVENTION: GUIDANCE</b> Assumption 1 (Self-concept): Self-directed learning needs Assumption 2 (Experiences): Gap between espoused theory and theories-in-use	
	<b>Facilitator activity:</b> Provide guidance with critical reflection if: - Teacher indicated that guidance is needed (see <b>ALT 10</b> ). - Gap between teacher's espoused theory and theories-in-use (see <b>ALT 11</b> ).	
ALT		
	<b>Cycle 3's review of serious game design strategies:</b> <b>Facilitator activity:</b> Facilitator provides guidance with critical reflection only if teachers are not within the desired flow channel. This means that the facilitator provides guidance in order to decrease the difficulty level of the intervention when: - The teacher performs consistently incompetent. - The teacher indicates that they find the difficulty level too challenging (reported during <b>Refined 10</b> ).	
Refined		

Figure 4.5: Refined substantive heuristics

Reflected in Figure 4.5 are the refined substantive heuristics for my envisaged intervention. I concluded activities 1 and 2 in this chapter and intend to conclude activities 4 and 5 in the second future study. As activities 5-13 represent my envisaged intervention's activities, I herewith provide a short overview of the activities envisaged for the participating teachers. Although the activities would be experienced by individual teachers, I refer to the teachers as a group in this overview.

Activities 5-14 follow the cyclical process of Kolb's (1984) experiential learning stages. The intervention starts with Kolb's (1984) concrete experience stage, which is executed in an analogue manner. This involves the teachers experiencing an authentic emotion-triggering problem situation within their real contextual setting (ALT, EI & Refined 5).

The concrete experience stage is followed by Kolb's (1984) active experimentation stage, which is executed in an analogue manner. This involved the teachers experimenting with potential solutions by employing one or more ER strategies to regulate the emotions triggered (ALT & EI 7). This activity is preceded by facilitators creating a supportive and understanding environment for the teacher experimentation and risk-taking (ALT 6).

The active experimentation stage would be followed by Kolb's (1984) reflective observation stage and abstract conceptualisation stage, which is executed in an analogue and digital manner. These stages are interdependent and occur in a spontaneous manner. While the teachers observe the actual outcome of the ER strategies that they employ (ALT & EI 8), the teachers and observers digitally report on the outcome that they experience or witness (ALT, EI & Refined 9). This means that the teachers have to conceptualise their choice of the ER strategy solutions employed based on the outcomes witnessed by themselves and the observers. A digital automated assessment of the teachers' and observers' reported input occur (ALT & EI 11), providing information on the teachers' attained learning and ER competency. This information, which would be presented digitally (ALT & Refined 12.1), allows for critical reflection and subsequent abstract conceptualisation from the teachers. Simultaneously, the teachers share ideas and insights through a digital learning community (ALT & Refined 12.2), providing the teachers with additional information for critical reflection and subsequent abstract conceptualisation. The facilitators provide guidance with critical reflection in specified circumstances (ALT & Refined 10 & 13). The facilitators also customise the difficulty level of the next emotion-triggering problem situation to be presented to the teachers based on specified information provided from the teachers' ER competency scores and the teachers own input (ALT & Refined 10 & 12.1).

The cycle is therefore repeated after the teachers' reflective observation and abstract conceptualisation, starting with a new emotion-triggering problem situation representing a customised and novel concrete experience (Kolb, 1984). The new ER problem situation therefore allows the teachers to test the ER strategy solutions generated through Kolb's (1984) stages of reflective observation and abstract conceptualisation.

#### **4.5.2 Design components**

The design components described here can be described as the design product derived and generated from the DR process that was followed. To conceptually design my first prototype, I relied on Van den Akker's (2013, p. 59) spider web of design components, as visualised in Figure 2.5 (Chapter 2). I adapted Van den Akker's (2013) spider web to coincide with the methodological DR terms used in this study. The spider web of design components consists of nine essential components linked to the rationale, constituting the reason for the intervention. Commencing with my envisaged intervention's goals and objectives, I now describe each design component aligned with the rationale of improving teachers' ER in order to contribute to their EI.

#### **Goals and objectives**

Goals entail a description of the long-term (Ornstein & Hunkins, 2014) product and process aims (Carl, 2012) of the envisaged intervention aligned with the rationale. Considering Carl's (2012, pp. 85-86) description of product and process aims for long-term purposes, the goal of my envisaged intervention is helping teachers to regulate their emotions (i.e. product goal) through employing appropriate ER strategies competently in different situations (i.e. process goal).

Objectives entail contextual refinements of the goal (Carl, 2012), which are related to pre-determined performance standards (Ornstein & Hunkins, 2014). Considering the substantive EI and Refined (3, 5 & 8) heuristics generated, I linked each objective of the envisaged intervention to three elements:

1. The type of context-bound emotion-triggering situation presented to the teachers.
2. The difficulty level of regulating such situations competently as determined by in-service teachers.
3. The outcomes to be expected from regulating such situations competently.

Firstly, different contextualised ER situations require different ER strategies to regulate one's emotions (Matthews et al., 2004). As such, each objective could represent a particular type of situation such as interpersonal conflict with a learner. Secondly, the types of ER situations are divided into different difficulty levels, each requiring a particular performance standard or ER competency level to accomplish successfully (Ornstein & Hunkins, 2014). As performance standards describe the level of achievement expected (Ornstein & Hunkins, 2014), objectives can thirdly be linked to the expected outcomes as an indication that an objective has been accomplished successfully. Apart from involving in-service teachers in selecting and determining objectives and appropriate difficulty levels, my serious game allows me to involve the teachers in evaluating the objectives' significance, realism, usefulness and relevancy, as indicated in the substantive ALT (4) heuristic.

## **Content**

Content entails what teachers would be learning in the envisaged intervention. Content furthermore entails horizontal content selection and vertical content organisation. In terms of horizontal content selection, which primarily refers to the breadth and depth of information covered (Ornstein & Hunkins, 2014), I relied on two primary sources. I firstly relied on the ER process (Figure 3.5, Chapter 3) derived from Gross's (1998a, 1998b) ER Theory. The ER process involved particular emotion-triggering situations that possibly activate an emotional need to down-regulate particular negative emotions, as represented in the substantive EI and Refined (5) heuristic. The ER process furthermore distinguishes five types of ER strategies that the teachers would potentially employ to regulate the negative emotions triggered as represented in the substantive EI (7 & 9) heuristics. I secondly relied on these in-service teachers' expressed ER experiences and practices as represented in the substantive EI (1) heuristic. Their expressed experiences and practices informed the ER process and subsequently provided the content on which I based the training, measurement and scoring of my envisaged intervention.

In addition to the pre-determined content that I generated from the two sources described, the content would be co-constructed by the teachers during the intervention. In line with the constructivist nature of my envisaged intervention, the substantive ALT & EI (9 & 12.2) heuristics provide for the teachers and observers to include additional ER strategies being employed or observed, and for collaborative idea generation between the teachers sharing insights, stories and ideas.

Vertical content organisation refers to (1) Continuity or how the content is repeated to give continuous opportunities to practice and develop skills, and (2) Sequence or how the content can build on what came before (Ornstein & Hunkins, 2014). In terms of continuity, the

substantive ALT (5-9, 12) heuristics provide for continuous learning through the cyclical stages of Kolb's (1984) Experiential Learning Cycle. The substantive Refined (21.1) heuristic furthermore provide for sequential content organisation through increased levels of difficulty matched to the teachers' competency level. Apart from involving in-service teachers in selecting content and linking appropriate difficulty levels represented in the substantive ALT and Refined (3) heuristic, I furthermore involved the teachers in evaluating the contents' significance, realism, usefulness and relevancy, as represented in the substantive ALT (4) heuristic.

### **Learning strategies**

Learning strategies refer to how the teachers would be learning the content, or the methods selected to facilitate learning in order to realise the goals and objectives (Carl, 2012; Jacobs, 2016; Ornstein & Hunkins, 2014). Socio-constructivist and humanistic ALT suggestions from six andragogic assumptions (Sub-section 3.3.1, Chapter 3) provided the theoretical foundation of my envisaged intervention. Based on the ALT suggestions and suggestions from the EI and ER literature, I also decided in accordance with the substantive ALT & EI (2) heuristic to adhere to design strategies from a serious game design.

Therefore, the learning strategies selected provided the theoretical and practical underpinnings facilitating learning in my envisaged intervention. As described earlier, the following five learning strategies are distinguished and represented in my substantive ALT, EI and Refined (5-13) heuristics:

- Experiential learning (Kolb, 1984) facilitated through stages of concrete experiences, active experimentation, reflective observation, and abstract conceptualisation.
- A state of flow (Csikszentmihalyi, 1990) strengthening internal motivation and subsequently learning through the incorporation of flow antecedents.
- Guidance with critical reflection in accordance with Vygotsky's (1978) ZPD.
- Technology-assisted learner analytics and collaborative learning communities.
- The incorporation of practical guidelines (Mayer & Moreno, 2002; Sweller, 1994; Sweller et al., 1998) to combat extraneous cognitive load within analogue and digital applications.

### **Assessment and evaluation strategies (measurement and scoring methods)**

The assessment strategies entail the methods selected to measure and score the teachers' learning during or after the intervention. In turn, the evaluation strategies entail the methods selected to measure and score the effectiveness of the intervention (Carl, 2012). The evaluation

strategies therefore refer to a determination of the envisaged intervention's quality (Carl, 2012) as part of the DR process. I employed the assessment strategies within my envisaged intervention, of which some were used for evaluation purposes.

I herewith refer to the assessment strategies reflected in the substantive heuristics. I conclude this discussion by describing the different uses of the assessment results, which include my use thereof for evaluating the ER serious game's effectiveness. The overarching assessment strategy embedded in the substantive heuristics is continuous authentic assessment. This entails the ongoing measurement and scoring of real-life problem solving within authentic contexts followed by appropriate feedback on performance (Carl, 2012; Ornstein & Hunkins, 2014). Similar to my selection of learning strategies, the ALT suggestions provided the theoretical foundation of my assessment decisions. Based on ALT, I subsequently made conjectural decisions with regard to the measurement and scoring methods from the EI literature review conducted and described in Sub-sections 3.4.2.4 and 3.4.2.8 (Chapter 3). In this study, I distinguish between measurement and scoring based on the purpose each served within my envisaged intervention. While measurement refers to the methods used to obtain information about the teachers' ER; scoring, in this study, refers to the methods used to determine the appropriateness of the teachers' ER choices (MacCann, 2006).

The measurement methods reflected in the substantive EI (7 & 9) heuristics involve the teachers' and observers' reports on the ER strategies employed. This means that directly after the teachers employed one or more ER strategy to regulate particular emotions triggered, the teachers and observers report (select or add) the ER strategy(ies) employed or witnessed. These reports are digitally recorded on a cell-phone application, which means that the teachers select ER strategies from a pre-determined and continuously updated list representing all previous ER strategies from the teachers presented with the same ER experience. While the teachers are likely to report on the deliberate, observable, non-observable and context-bound ER strategies that they employed, the observers are likely to report on the deliberate, non-deliberate, observable and context-bound ER strategies employed by the teachers.

I included two scoring inferences by comparing the results of these two reports represented in the substantive ALT & EI (11) heuristic. These entail (1) Transformational learning and (2) Measurement objectiveness. Any transformational learning taking place would be determined by a lack of discrepancy between the teachers own beliefs (Espoused Theory) about their ER practices to be inferred from the teacher report, and their actual ER practices (theories-in-use) to be inferred from the observer report (Argyris & Schön, 1974). The transformational learning taking place provides an indication of learning attainment, and intervention effectiveness. In



turn, measurement objectiveness can be expected to equally be determined by a lack of marked discrepancies between the teacher and the observer report. This is based on the notion that at least one ER strategy employed would be consistent between the two reports. Reports earmarked as clearly subjective would be judged and possibly discarded to guard measurement effectiveness.

The measurement methods reflected in the substantive EI (9) heuristic also involve the teachers' and observers' reports on the outcomes of the ER strategies employed by the teachers. This means that the teachers report on the actual emotional and short-term outcomes experienced, as well as the potential long-term consequences reflected on. The observers equally report on the short-term outcome witnessed, as well as the potential long-term consequences. These reports are also digitally recorded on a cell-phone application, which means that scoring is automated, and the results are available in real time. The purpose of these reports is to determine the teachers' ER competencies based on the contextual appropriateness of the ER strategies that they employ (refer to Figure 3.6, Chapter 3). This means that if all of the outcomes are positively rated, the particular ER strategy(ies) employed are deemed contextually appropriate.

Two scoring inferences that I included by combining the results of these two reports represented in the substantive ALT & EI (11) heuristic entail (1) Teachers' ER competency and (2) Experiential learning. The teachers' ER competency would be determined by the combined contextual appropriateness of the ER strategies that they employed. ER competency also provides an indication of the experiential learning taking place through continuous reflection, conceptualisation and experimentation. In turn, experiential learning attainment provides an indication of the intervention's effectiveness.

The results of the four described scoring inferences are subsequently presented within a performance and progress report, as represented in the substantive ALT & Refined (12.1 & 13) heuristics. This report is used for the following purposes:

- Teachers use the reports for critical reflection on own performance.
- Facilitators use the report to customise (adapt) learning difficulty based on the teachers' ER competency and input, and to decide on the provision of guidance.
- The researcher will use the report as an indication of transformational and experiential learning attainment, and as an evaluation of the intervention's effectiveness.

Apart from using the progression and progress report for evaluation purposes, I intend to employ additional evaluation strategies within a future second study. This entails a quality

determination of the implemented intervention's (1) Relevance, fairness and comprehensiveness, (2) Consistency, (3) Practicality and (4) Effectiveness in close collaboration with the end users (McKenney et al., 2006).

### **Role of the facilitator**

The role of the facilitator refers to how the intervention would be facilitated (Van den Akker, 2013). Four facilitator activities are reflected in the substantive heuristics generated. These involve:

- The creation and sustainment of a particular learning environment represented in the substantive ALT (6 & 12.2) heuristics.
- The customisation of learning represented in the substantive ALT & Refined (12.1) heuristic.
- The provision of collaborative guidance represented in the substantive Refined (12.2) heuristic.
- The provision of guidance represented in the substantive ALT & Refined (10 & 13) heuristics.

The facilitators are firstly responsible for creating and sustaining an understanding and supportive environment where all involved in the intervention encourage the teachers' experimentation and risk-taking as part of the learning process. In addition, the facilitators create and sustain a technology-assisted community learning atmosphere characterised by mutual respect, trust, appreciation, support and acceptance. The facilitators are secondly responsible for customising (adapting) learning difficulty based on the teachers' reported ER competency and input. This means that the facilitators decide which ER problem situation the teachers would be exposed to next and the organisation of the actual concrete experience. The facilitators are thirdly responsible for guiding the collaborative ideation process from unstructured ideas to original and suitable solutions considering the context-bound constraints and available resources. The facilitators are finally responsible for guiding the teachers with critical reflection under specified circumstances.

### **Materials and resources**

Materials and resources refer to what would be used to conduct the intervention (Van den Akker, 2013). Materials and resources can be divided according to what would be used during the envisaged intervention's analogue applications represented in the substantive EI (5 & 7)

heuristics, as well as the intervention's digital applications represented in the substantive ALT, EI & Refined (9, 10 & 12) heuristics.

In terms of the analogue application, pre-determined materials and resources would be provided based on the authentic and context-bound ER situations presented to the teachers. In addition, naturally available materials and resources would be used when the teachers employed particular ER strategies. In terms of the digital application, the participating teachers and observers would use a cell-phone application. This means that the application can be pre-loaded on the participating teachers' and observers' cell-phones or that cell-phones can be provided for reporting, learning analytics and collaborative learning purposes.

### **Grouping**

Grouping refers to with whom the teachers would be learning (Van den Akker, 2013). Multiple teachers from different schools could participate after the initial setup within each school. To least disrupt the teaching environment within one school, it is deemed sensible to have two or three teachers participating simultaneously, although individually. Additional individuals such as colleagues or learners furthermore participate in the creation of particular ER situations represented in the substantive EI (5) heuristic. These individuals also include observers reporting on the teachers' ER strategies employed as represented in the substantive EI (9) heuristic. The teachers would furthermore take part in a technology-assisted learning community represented in the substantive ALT (12.2) heuristic. This learning community would consist of participating and post-participating teachers from various schools representing teachers with similar ER experiences, but different ER experience levels. The learning community provides opportunities for collaborative learning, and in particular, collaborative problem solving or idea generation.

### **Location and time**

The location and time refer to where and when the teachers would be learning (Van den Akker, 2013). The location and time entail both the physical analogue environment represented in the substantive EI (5, 7 & 8) heuristics, as well as the digital environment represented in the substantive ALT, EI & Refined (9, 10 & 12) heuristics.

The analogue's physical application is represented in how the ER situations would be presented to the teachers. These situations would result in the ER strategies being employed by the teachers and the outcome thereof observed within the teachers' real-life contextual setting such as a classroom; and during normal teaching hours. Digitally, there would be four user-interfaces. The first interface allows the teachers and observers to report on the ER strategies employed, as

well as the outcome thereof. The second interface allows the teachers to report on the level of guidance required, as well as the appropriateness of the difficulty level. Both these interfaces needed to be attended to directly after the outcome of the ER strategies employed was experienced or observed by the teachers and observers. The third and fourth interfaces are to be attended to during or after normal teaching hours. These interfaces provide for critical reflection and include the provision of learner analytics in the form of a performance and progress report, and the provision of a learning community of teachers.

As described in Section 4.2, I attempted to guide the quality of the global design described by formatively evaluating each Phase and Cycle's output (refer to Figures 4.1 & 4.2). This meant that I evaluated the evolving substantive heuristics, as well as the procedural heuristics in order to generate improvements (Thijs & Van den Akker, 2009). I describe these formative evaluations in Chapter 2, and in detail in my Field Notes (Appendix P).

# CHAPTER 5 CONCLUSION

## 5.1 INTRODUCTION

In this chapter, I conclude this study by summarising the processes that I followed by adhering to my procedural heuristics. This allowed me to produce a concept serious game intervention meant as a product under development. As such, my concept is represented in my substantive heuristics. I furthermore provide a conclusion involving summarised answers to the secondary research questions that I posed. I end this chapter by providing a summarised description of the implications of this study and my recommendations for the second future study.

I initiated this study as a combined theory- and practice-based solution to the educational problem of fostering in-service teachers' EI in South Africa. This study is set in the context of a seeming lack of attention being paid to teachers' emotions as part of their professional development (Lubala, 2017; Palmer & De Waal, 2011), in spite of prevailing educational demands. This therefore necessitates an emotionally intelligent workforce (Bichelmeyer et al., 2010; Maree & Mokhuane, 2007). Research from multiple authors (Jennings & Greenberg, 2009; Joseph & Newman, 2010; Perry & Ball, 2007) provides empirical evidence that indicates that teachers' EI contributes to professional efficiency and learner outcomes. In addition to these practical concerns, there is an apparent lack of documented theoretical underpinnings of existing EI interventions (Thory, 2013). The acknowledgement of existing interventions for teachers as adult learners with distinct learning needs and interests is particularly lacking in the literature (Knowles, 1980; Merriam & Bierema, 2014). As such, effectively contributing to the fostering of teachers' EI within the complex South African educational system seemed to necessitate solutions from both theory- and practical-orientated research (Schutte et al., 2013). In this study I acknowledged the complexity of the educational problem, as well as teachers' distinct needs as adult learners. I therefore aimed to develop a contextualised intervention grounded in ALT through the application of DR.

I initiated this study as the first of a two-part DR research project. This study provided a conceptualisation of the first prototype design of my envisaged intervention. The second future study will focus on the finalisation of the current prototype design, as well as the implementation and validation thereof in practice.

Through my initial reviews and analysis, my envisaged intervention took on the form of an ER serious game for teachers. This process and product description represent the yields of this study and constitute the procedural and substantive heuristics described in the next two sections.

## 5.2 SUMMARY OF THE STUDY – THE PROCESS

The purpose of this section is to provide a short overview of the processes that I followed to conduct this study, which I describe in detail in Chapter 2. The processes that I followed constitute the procedural heuristics of this study, which entail the procedures that I selected and applied to develop a potentially contextualised and workable intervention (Alghamdi & Li, 2013; Plomp, 2013; Wang & Hannafin, 2005).

I employed a pragmatic DR approach combining development and research. I derived generic activity-based processes from existing DR models (e.g. McKenney et al., 2006; Plomp, 2013) that I found relevant to the educational problem and the contextualised needs of the end users. I therefore addressed the educational problem through my own DR model (Figure 2.2, Chapter 2) containing several cycles of iterations, each constituting systematic input-process-output (Ellington, Earl, & et al., 1996) activities before I conceptualised an optimal solution. As I followed a pragmatic approach, I focused on what works in each cycle, which allowed me the freedom to select and adapt appropriate methodological activities as the research progressed (Creswell, 2007; Schuh & Barab, 2008).

How I applied the study's DR phases, cycles and activities encapsulates my personalised procedural conceptual framework for developing my envisaged intervention (refer to Figures 2.3 & 2.5, Chapter 2). This means that the substantive heuristics representing my envisaged intervention evolved through phases, cycles and activities. While the entire research project consists of three phases, this study ends with the first cycle of the second phase.

Phase 1 of my DR process constituted an initial review and analysis that provided the theoretical grounding for design decisions made in Phase 2. In this study, Phase 2 constituted the conceptual prototype design of my envisaged intervention. Phase 2, during the future second study, will constitute evolving prototypes until a completed intervention is implemented. Phase 3 in the future second study will constitute a summative evaluation to empirically test the completed heuristics by determining the extent to which the intended intervention is attained by the end user (McKenney et al., 2006; Nieveen & Folmer, 2013).

This study focused primarily on the theoretical groundwork by confirming and refining a set of transparent and quality-orientated substantive heuristics informing subsequent design decisions. During Cycle 1, I conducted reviews of the ALT, EI and ER literature to generate a set of conjectural substantive heuristics, which in turn prompted Cycles 2 and 3 of Phase 1. During Cycle 2, I conducted an analysis of in-service teachers' contextualised ER needs through a qualitative investigation (refer to Figure 2.6, Chapter 2) that included two rounds of analysed

semi-structured interviews with in-service teachers. During Cycle 3, I explored serious game design strategies that further refined and actualised my substantive heuristics. From the refined substantive heuristics generated in Phase 1, I was able to conceptually design the first prototype during Cycle 4, Phase 2. My design strategy during Cycle 4 constituted the generation of a global design (Nieveen & Folmer, 2013), which constitutes a description of each design component as derived from the refined substantive heuristics generated. For this purpose, I used Van den Akker's (2013) 'spider web' of design components visualised in Figure 2.5 (Chapter 2). Applying the spider web of design components guided me to establish interconnected design decisions, which contributed to the overall quality of the global design.

To further guide the quality of the evolving intervention and to generate improvements (Thijs & Van den Akker, 2009), I conducted quality reflections and a formative evaluation of each cycle's evolving heuristics (refer to Figure 2.4, Chapter 2). My evaluation method involved researcher screenings focused on particular quality criteria (refer to Sub-section 2.5.4, Chapter 2). Based on my reflections and evaluations, I identified potential threats to my heuristics' quality, and attempted to iteratively mitigate these threats by modifying or improving the evolving heuristics where possible. Based on where this study ends within my procedural framework and my choice of quality-orientated activities and methods, my heuristics are currently justified only by theoretical arguments. This means that the heuristics' practicality and effectiveness will only be empirically justified when implemented (Plomp, 2013) during the second future study. Layers of quality evaluations therefore provide the end user with empirical evidence of quality within the actual contextual setting (Van den Akker, 2013).

I decided to employ DR as it is the preferred approach for complex and innovative interventions, especially where a shortage of validated knowledge about 'how to do it' exists to structure and support the development process (Van den Akker, 2013). In addition, I employed DR based on the benefits it provided over and above traditional educational development approaches.

The *first* benefit from applying DR's dual aim meant that I potentially contributed to both theory and practice. This means that my concluding heuristics firstly allowed me to conceptualise a contextualised educational intervention in practice (Clements, 2007; Van den Akker, 2013). The heuristics secondly allowed me to broaden my theoretical contribution to the knowledge base on the educational problem, as well as to the field of educational development (Van den Akker, 2013). I thus provided theoretically grounded heuristics, which are also practical and usable (McKenney et al., 2006; Plomp, 2013).

The *second* benefit from applying DR's rigorous, but flexible approach meant that I was able to refine and confirm quality-orientated and transparent heuristics (Plomp, 2013; Wang &

Hannafin, 2005). Continuously documenting my reflections and formative evaluations informed by a set of context-bound quality criteria provided the primary emphasis for the modifications and improvement that I made to the evolving heuristics (Thijs & Van den Akker, 2009). I potentially lessened the seeming lack of transparency characterised by complex research processes involving many interpretations and iterations (Akkerman et al., 2008). The quality-orientated and transparent nature of the heuristics furthermore means that it may be used by (Nieveen & Folmer, 2013) (1) Researchers of interventions in practice, (2) Designers of similar interventions, (3) Future users interested in applying selected information, and (4) Policy makers interested in research-based decisions regarding complex educational problems.

The *third* benefit from applying DR's collaborative approach (Van den Akker, 2013) meant that I was able to involve the end-user in the development of the envisaged intervention's content, and as such addressed their contextualised ER needs. In turn, an increase in ownership, internalisation of what should be learned, implementation success and practical usability has potentially been optimised (Hoadley, 2004; McKenney et al., 2006; Parsons & Beauchamp, 2012; Plomp, 2013; Van den Akker, 2013; Wang & Hannafin, 2005).

The *fourth* benefit from applying DR's provision of an intensive and systematic initial review and analysis phase meant that I was able to increase the quality of my envisaged intervention. As such, my research focus adhered to Phillips's (2006, p. 147) argument that an undesirable amount of emphasis is placed on the testing or validation of design outcomes, while "factual and theoretical background knowledge" embedded in the earlier phases ensures the quality of the outcome.

### **5.3 FINDINGS – THE PRODUCT**

The purpose of this section is to provide a short overview of the conceptual prototype in the form of a global design that I produced as a result of the procedural process followed, and which I describe in detail in Section 4.5 (Chapter 4). My global design constituted a brief description of the envisaged intervention's design components (Nieveen & Folmer, 2013) as derived from the refined substantive heuristics that I generated (Figure 4.5, Chapter 4). As explained earlier, I relied on Van den Akker's (2013) spider web of design components (Figure 2.5, Chapter 2), which consists of nine essential components linked to the rationale of improving teachers' ER in order to contribute to their EI.

The *first design component* entails *goals and objectives*. Considering Carl (2012) and Ornstein and Hunkins' (2014) descriptions thereof, the goal of my envisaged intervention is to help teachers to regulate their emotions through employing appropriate ER strategies competently



in different situations. In turn, I linked the envisaged intervention's objectives to (1) The type of context-bound, emotion-triggering situation presented to teachers; (2) The difficulty level of regulating these situations competently; and (3) The outcomes to be expected from regulating these situations competently.

The *second design component* entails the *content* on which I based the training, measurement and scoring. Considering Carl (2012) and Ornstein and Hunkins' (2014) descriptions thereof, the horizontal content selection of my envisaged intervention involves three sources. I firstly relied on the ER process (Figure 3.5, Chapter 3) derived from Gross' (1998a, 1998b) ER Theory. I secondly relied on the in-service teachers' expressed ER experiences and practices obtained from my qualitative inquiry informing the ER Theory. I will thirdly rely on co-constructed content to be generated during the intervention. This means that participating teachers and observers digitally add the additional ER strategies being employed; and share insights, stories and ideas through collaborative idea generation. In terms of the vertical content organisation of my envisaged intervention, I applied (1) Continuous learning through the cyclical stages of Kolb's (1984) Experiential Learning Model, and (2) Sequential learning through increased levels of difficulty matched to the participating teachers' competency levels.

The *third design component* entails the *learning strategies*. Considering Carl (2012), Jacobs (2016), and Ornstein and Hunkins' (2014) descriptions thereof, I incorporated five learning strategies based on the ALT, EI, ER and serious game design literature. These involved strategies related to (1) Experiential learning (Kolb, 1984); (2) Flow Theory (Csikszentmihalyi, 1990); (3) Vygotsky's (1978) ZPD; (4) Learner analytics and collaborative learning communities; and (5) Minimising extraneous cognitive load.

The *fourth design component* entails the *assessment and evaluation strategies*, and in particular, the measurement and scoring methods incorporated. Considering Carl (2012), and Ornstein and Hunkins' (2014) descriptions thereof, I applied continuous authentic assessment. I particularly incorporated measurement and scoring methods allowing for the inferences of (1) The experiential and Transformational learning taking place; (2) Measurement objectiveness; and (3) Teachers' ER competency. In turn, the authentic assessment results are partly used by the researcher as an evaluative measure of the intervention's effectiveness together with additional evaluation strategies being employed in the future second study.

The remaining three design components constitute the *format* of my envisaged intervention. As such, the *fifth design component* entails the *role of the facilitator*. Considering Van den Akker's (2013) description thereof, I applied four facilitator activities. These involved responsibilities related to (1) The sustainment of a particular learning environment; (2) The customisation of

learning; and (3) Guidance with critical reflection and collaborative learning. The *sixth design component* entails *materials and resources*. Considering Van den Akker's (2013) description thereof, my envisaged intervention relies on pre-determined and naturally available materials and resources for the analogue application. The intervention furthermore relies on a pre-loaded cell-phone application for digital purposes such as reporting, learning analytics and collaborative learning. The *seventh design component* entails the *grouping* of the participating teachers. Considering Van den Akker's (2013) description thereof, my envisaged intervention accommodates multiple teachers from the same and different schools participating simultaneously. The *eighth and ninth design components* entail the *location and time*. Considering Van den Akker's (2013) description thereof, my envisaged intervention's analogue application is incorporated into teachers' real-life contextual setting such as a classroom; and during normal teaching hours. In turn, the digital application consists of user-interfaces for reporting purposes during normal teaching hours, and for reflection on learner analytics and collaborative learning during or after normal teaching hours. Based on the process and product descriptions summarised in the two previous sections, I was able to answer the secondary research questions posed.

#### 5.4 CONCLUSIONS

The purpose of this section is to provide summarised answers to the research questions posed in this study. The primary research question was: **How can one conceptualise a contextualised ER intervention in the form of a serious game that aims to foster in-service teachers' EI from an adult learning perspective?** I responded to this question by answering the secondary research questions, which I aligned to the structure of this dissertation and to the heuristics generated in this study.

I attempted to answer the first secondary research question in Chapter 2: *How can the application of DR be used to conceptually develop a contextualised ER serious game?* As a well-structured process for conducting DR has not yet been established (Alghamdi & Li, 2013), I derived generic, activity-based processes from existing DR models (e.g. McKenney et al., 2006; Plomp, 2013) to produce a set of substantive and procedural heuristics. Therefore, my own DR model (Figure 2.2, Chapter 2) concurs with the generic, activity-based processes which are primarily process- and systemic-orientated (Plomp, 2013). This meant that I refined or confirmed my heuristics through iterative cycles of reviews and analysis, design and evaluation (Plomp, 2013; Wang & Hannafin, 2005). I conceptualised both sets of heuristics pragmatically. I thus employed both subjectivist and objectivist (Morgan & Sklar, 2012) methodological decisions (refer to Sub-section 2.5.1, Chapter 2), depending on what worked in each cycle. I

applied the study's DR phases, cycles and activities as encapsulated in my personalised procedural conceptual framework (Figures 2.3 and 2.5, Chapter 2) derived from the DR literature, including Plomp (2013). In order to develop a suitable intervention in practice, I conducted an intensive and systematic initial review and analysis. I researched state-of-the-art theoretical and practical sources of information during my initial review and analysis. These sources involved acknowledging researchers in the fields of ALT, including Knowles (1990); EI, including MacCann (2006); ER, including Gross (2014); in-service teachers' expressed contextualised ER needs; and finally, serious game design strategies, including those of Kiili (2005a). In addition to the generic processes' formative evaluation of the design process, I included quality-orientated reflections and formative evaluations of my reviews and analyses conducted. For this purpose, I applied the quality criteria recommended by Nieveen and Folmer (2013), specifically geared towards the use of a DR approach. Six overarching quality criteria guided all my reflections and evaluations (refer to Chapter 2, and Appendix A-D, P).

I attempted to answer the second secondary research question in Chapter 3: *What is the nature of existing EI intervention constraints and how can they be alleviated within an adult learning environment?* From the ALT literature, I first generated instructional suggestions for an optimal adult learning environment relevant to teachers' professional development (refer to Section 3.3, Chapter 3). I considered instructional suggestions representing a combination of ALTs. This meant that I focused on Andragogy Theory (Knowles, 1998), comprising six adult learning assumptions that coherently combine major ALTs (Merriam & Bierema, 2014) such as self-directed learning (Houle, 1961; Tough, 1967) and transformational learning (Mezirow, 1978). I then identified three salient EI intervention constraints deterring their use in my envisaged intervention (refer to Section 3.4, Chapter 3), which were relevant to the ALT suggestions generated. These related, in particular, to my envisaged intervention's content, measurement and scoring practices. These constraints constituted (1) Conflicting EI theories; (2) Subjective measurement of non-actual EI; and (3) Subjective and contextually-insensitive scoring. I identified particular alleviating suggestions from prominent EI contributors, including Austin and Saklofske (2010), which I found relevant to the ALT suggestions generated and to teachers' contextualised ER needs. I used these alleviating suggestions to generate relevant, fair and comprehensive conjectural decisions forming the basis of my conjectural substantive heuristics (refer to Section 3.5, Chapter 3). I then attempted to alleviate the identified EI intervention constraint within an adult learning environment geared towards the professional development of teachers.

The subsequent two secondary research questions were prompted by two all-encompassing conjectural decisions. The first decision was to focus my envisaged intervention's content on the

contextualised ER needs of teachers. ER was selected as a common facet of EI. The second decision was to integrate the intervention into teachers' real-life through the application of a serious game.

Based on the first conjectural decision indicated, I attempted to answer the third secondary research question in Chapter 4 (Section 4.3 and 4.5): *What are the ER needs of in-service teachers and how can it inform the conceptualisation of a contextualised intervention for teachers?* Through my analysis of the in-service teachers' expressed contextualised ER needs, I obtained relevant content as the basis for my envisaged intervention's training, measurement and scoring. For this purpose, I gathered information about the teachers' ER needs according to an ER process (Figure 3.5, Chapter 3) that I derived from Gross' (1998a, 1998b, 2014) ER theory. My analysis' derivatives based on this ER process involved:

- Particular emotion-triggering situations, such as work-overload, expressed as being experienced by the teachers (refer to Sub-section 4.3.1, Chapter 4).
- ER goals that the teachers expressed as being activated by these emotion-triggering situations, such as the need to decrease a feeling of frustration (refer to Sub-section 4.3.2, Chapter 4).
- ER strategies that the teachers expressed as being employed in order to achieve the ER goals activated (refer to Sub-section 4.3.3, Chapter 4).

These derivatives, which represented the contextualised ER needs of the teachers, informed and refined my conjectural substantive heuristics. In particular, the derivatives refined the content to be embedded in the design components of my envisaged intervention (refer to Section 4.5).

Based on the second conjectural decision indicated, I attempted to answer the fourth secondary research question, also found in Chapter 4 (Section 4.4 and 4.5): *How can serious game design strategies provide application value to the conceptualisation of a contextualised intervention for teachers?* Through my exploration of the theoretical and practical strategies embedded in a broad spectrum of serious game design approaches, I first identified three over-arching strategies that I found relevant to the ALT suggestions generated, and to teachers' contextualised ER needs. As described in Sub-section 4.4.3 (Chapter 4), and obtained from Kiili's (2005a, 2005b, 2006, 2007) Experiential Gaming Model (Figure 4.3, Chapter 4), the three overarching strategies provided application value to my envisaged intervention in the following manner:

- Ideation and experience loops provided, for example, design strategies for collaborative idea generation and experiential learning.

- Creation and sustainment of flow provided, for example, design strategies that will contribute to teachers' intrinsic motivation to learn from the intervention.
- Minimising extraneous cognitive load provided, for example, design strategies for optimising learning within analogue and digital learning applications.

These serious game design strategies further informed and refined my conjectural substantive heuristics. Specifically, the strategies refined my learning strategies to be embedded in the design components of my envisaged intervention (refer to Section 4.5, Chapter 4).

In order to generate quality-orientated heuristics, I attempted to answer the fifth research question integratively in Chapters 2-4: *How can the application of DR increase the quality of the conceptualised ER serious game characteristics and development processes followed?* I conducted two activities to produce transparent and quality-orientated heuristics from which my envisaged ER serious game was derived. I first conducted quality-orientated reflections during my reviews and analysis conducted. I secondly conducted quality-orientated formative evaluations after each review or analysis conducted, and after the conceptualisation of my first prototype design. These two activities formed the basis of the adaptations and improvements made (Thijs & Van den Akker, 2009) (Figure 2.4, Chapter 2). I attempted to increase transparency by:

- Documenting the quality-orientated reflections that I conducted (refer to Sub-sections 3.4.1 & 3.4.2, Chapter 3; and Sub-sections 4.3.4 & 4.4.4, Chapter 4).
- Generating researcher screening checklists (Appendices A-D) for the purpose of formative evaluation that clarifies the reasons for any adaptations and improvements made (Bakker & Van Eerde, 2015).

I conducted quality reflections and formative researcher screenings based on a shifting set of quality criteria recommended by Nieveen and Folmer (2013). The criteria involved (1) Relevance, fairness and comprehensiveness; (2) Consistency; (3) Expected practicality; and (4) The expected effectiveness of my evolving intervention (refer to Sub-section 2.5.4, Chapter 2). Based on the potential threats identified during my quality-orientated reflections and evaluations, I conducted iterative mitigated actions to improve my heuristics' quality where possible. I described these threats, limitations and mitigated actions in Chapter 2; and in detail in my Field Notes (Appendix P). I regarded threats that I was unable to mitigate as this study's limitations, for which I dually recommended mitigated actions to be taken in the second future study. As such, the limitations identified, together with additional research constraints, affected this study and the future second study in this research project, as described in the next section.

## 5.5 IMPLICATIONS

The purpose of this section is to provide a description of the constraints that affected my research decisions in this study, as well as regarding the future second study. Three overarching constraints affected my research decisions. Firstly, the EI limitations that I reviewed restricted my use of existing EI theories, measurement and scoring practices in my envisaged intervention. This constraint prompted my decision to investigate alternative possibilities as EI content, measurement and scoring practices. In particular, this meant that I had to review and align suggestions from prominent EI scholars to my ALT suggestions generated, and to the teachers' contextualised needs.

Secondly, the lengthy, resource intense, contextualised and iterative nature of DR (Herrington et al., 2007; McKenney et al., 2006; O'Donnell, 2004; Wang & Hannafin, 2005) restricted me in concluding all DR phases in one study. This constraint prompted my decision to divide the study into two distinct research studies. This, however, meant that I have to revisit up-to-date ALT and EI suggestions, as well as serious game strategies when the second study commences. In addition, this means that my heuristics generated are currently only justified by theoretical arguments, and that I need to justify their implemented practicality and effectiveness with empirical evidence (Plomp, 2013) as part of the second future study.

Thirdly, additional limitations to the heuristics' quality that I identified through formative screenings in this study affected my research decisions for the second future study. The limitations experienced or envisaged related to (1) My current limited understanding of external forces of the broader social/educational context (Cohen et al., 2011), which could potentially influence my envisaged intervention; and (2) The potential of the envisaged intervention being disruptive in the actual context, as well as being cost-, time- and resource-intensive. These limitations, described in Appendix P, prompted my decision to:

1. Incorporate the formative evaluation method of a try-out before I implement the envisaged intervention. This means trying it out in the day to day user setting with a limited number of members of the user group (Thijs & Van den Akker, 2009);
2. Involving role-players such as in-service teachers, learners, curriculum consultants, principals, parents and community members in formative evaluations (Ornstein & Hunkins, 2014) of the evolving prototype (Plomp, 2013; Thijs & Van den Akker, 2009; Van den Akker, 2013).

## 5.6 RECOMMENDATIONS

The purpose of this section is to highlight the core literature gaps that I experienced while conducting this study, and to provide potential suggestions for future research. I herewith focus on the DR, ALT, EI, ER and serious game design literature.

As described earlier, a DR approach provides significant benefits for educational research focused on theoretical and practical solutions to complex educational problems (Van den Akker, 2013). I therefore agree with DR contributors (Alghamdi & Li, 2013) who argue in favour of an agreed upon, well-structured process for conducting DR, as such a process might encourage the increase use of DR. In line with the pragmatic nature of DR, I suggest that researchers focus on consolidating what process-orientated activities worked in practice.

ALT might significantly increase the effectiveness of teachers' professional development initiatives (Beavers, 2009). It is therefore concerning that there is currently a scarcity of research linking ALT with the professional development practices of teachers (Beavers, 2009). My experience in this study is that the teaching profession poses unique challenges and opportunities for effective professional development. I therefore suggest that researchers strengthen the link between teachers' professional development and ALT.

As also described earlier, EI interventions can significantly impact teachers' professional and personal lives in a positive manner (Maree & Mokhuane, 2007). It is therefore concerning that current conflicting views on EI theory limits theoretically-grounded EI interventions or research validating the outcomes of existing EI interventions (Humphrey et al., 2007). I therefore agree with EI contributors (Austin & Saklofske, 2010; Van Rooy et al., 2010) who suggest that researchers focus on a common facet of EI linked to the context-bound needs of their target population. This suggestion might contribute to an agreed-on understanding of EI.

ER interventions in particular can significantly impact teachers' professional and personal lives in a positive manner (Bagheri et al., 2016). It is therefore equally concerning that teachers' emotion regulation is largely unexplored (Gong et al., 2013; Jennings & Greenberg, 2009), especially with regard to the training or application of ER strategies (Thory, 2013). In order to broaden this field, I therefore suggest that researchers explore alternative ways to train ER strategies in teachers' workplace.

Serious game design research has in recent years proliferated based on an agreement amongst serious game researchers, which is a valid platform for learning and assessment purposes (McClarty et al., 2012). I, however, experienced that existing serious game design approaches

provide limited design strategies for learner assessment. Given a digital serious game platform, the potential for automated stealth assessments (Shute et al., 2009) is significant. In essence, stealth assessment provides a measurement method that invisibly and cumulatively collects evidence from learners' actions, while maintaining the game features needed to support learning (Shute et al., 2010). Although I explored the potential of stealth assessment for my envisaged intervention, I did not find it suitable in terms of the nature of ER. I do, however, suggest that serious game researchers recognise the significance of stealth assessments for their own assessment purposes.

## **5.7 CLOSING REMARKS**

Educational policy makers, researchers and developers of educational interventions should be made aware of the need to foster teachers' EI. Well-structured and suitable professional development EI interventions therefore need to be supported and encouraged by educational decision-makers.

As such, I attempted to answer my primary research question in order to achieve a dual aim. The primary research question was: *How can one conceptualise a contextualised ER intervention in the form of a serious game that aims to foster in-service teachers' EI from an adult learning perspective?* In answering this research question, I firstly aimed to generate theory and practice-based, quality-orientated heuristics that might guide the development of a contextualised EI intervention for teachers. I secondly aimed to use such heuristics to attempt to contribute to the knowledge base on the educational problem of fostering teachers' EI, as well as to the field of educational development.

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## APPENDIX E ETHICAL CLEARANCE



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA  
Faculty of Education

### RESEARCH ETHICS COMMITTEE

<b>CLEARANCE CERTIFICATE</b>	CLEARANCE NUMBER: <b>SM 15/08/01</b>
<b>DEGREE AND PROJECT</b>	M.Ed Development of an emotion regulation serious game for educators
<b>INVESTIGATOR</b>	Ms Danel van der Walt
<b>DEPARTMENT</b>	Science, Mathematics and Technology Education
<b>APPROVAL TO COMMENCE STUDY</b>	21 January 2016
<b>DATE OF CLEARANCE CERTIFICATE</b>	16 April 2018

**CHAIRPERSON OF ETHICS COMMITTEE:** Prof Liesel Ebersöhn

A handwritten signature in blue ink, appearing to read 'Bronwynne Swarts'.

**CC** Ms Bronwynne Swarts  
Dr Grietje Haupt

This Ethics Clearance Certificate should be read in conjunction with the Integrated Declaration Form (D08) which specifies details regarding:

- Compliance with approved research protocol,
- No significant changes,
- Informed consent/assent,
- Adverse experience or undue risk,
- Registered title, and
- Data storage requirements.

## APPENDIX F PERMISSION FROM DEPARTMENT OF EDUCATION



**Education and Sport Development**  
Department of Education and Sport Development  
Departement van Onderwys en Sport Ontwikkeling  
Lefapha la Thuto le Tihabololo ya Matshameko  
**NORTH WEST PROVINCE**

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### OFFICE OF THE DIRECTOR: BOJANALA DISTRICT

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Eng. Dr. ET Matshidiso

To : Ms. Danel van der Walt  
University of Pretoria – Pretoria

From : Mr. M. V. Seshibe  
District Director – Bojanala District

Date : 19 August 2015

#### **Subject: Permission to access schools for purpose of conducting Research**

Reference is made to your letter dated the 01<sup>st</sup> August 2015 regarding the above matter. The content is noted and accordingly, approval is granted for your kind self to visit schools as requested for the purpose of conducting a research in your sampled 2 urban and 2 rural secondary schools in the Madibeng Municipality, subject to the following provisions:-

- That you notify Area and Circuit Managers about your request and this subsequent letter of approval;
- That the onus to notify principals of your target schools about your intended visit and the purpose thereof rests with your good self;
- That participation in your research project will be voluntary;
- That as far as possible the general academic programme of the schools should not be interfered with; and
- That upon completion of your research, a report is send to my Office detailing the major findings and recommendations of your research and/or a final copy of your Thesis.

With my best wishes

M. V. Seshibe – District Director

cc Area Managers – Madibeng and Letlhabile Area Offices