Collaborative exploration of language teachers' digital didactical designs for tablet classrooms

by

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10260766

Submitted in partial fulfilment of the requirements for the degree

MAGISTER EDUCATIONIS

in the Faculty of Education

UNIVERSITY OF PRETORIA

Supervisor: Dr Maryke Mihai

March 2021

DECLARATION

I declare that the thesis, which I hereby submit for the degree Magister Educationis in **Collaborative exploration of language teachers' digital didactical designs for tablet classrooms** 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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Annèl van Rooyen

March 2021

ETHICAL CLEARANCE CERTIFICATE

UNIVERSITEIT VAN PRETORIA
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Faculty of Education

RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE	CLEARANCE NUMBER: **EDU046/20**
DEGREE AND PROJECT	MEd Collaborative exploration of language teachers' digital didactical designs for tablet classrooms
INVESTIGATOR	Mrs Annèl van Rooyen
DEPARTMENT	Science, Mathematics and Technology Education
APPROVAL TO COMMENCE STUDY	11 May 2020
DATE OF CLEARANCE CERTIFICATE	01 March 2021

CHAIRPERSON OF ETHICS COMMITTEE: Prof Funke Omidire

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Ms Thandi Mngomezulu
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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.

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

ACKNOWLEDGEMENTS

Being a teacher at heart, the impact of my research was one of the key considerations to me. I asked myself the question *How can my research make a difference to teachers' current teaching practices?* and this, specifically, guided my choice to use action research. While I have come to realise that research can in no way aim to improve or induce change, I have experienced that everyone involved in the research process, both myself and the participants, were influenced in some way (either positive, negative, or neutral). I know that conducting research has changed me – my thinking, my level of perseverance and my perspective in general.

Throughout my life, the quality of my work could be ascribed to wonderful mentors whose insights and rich inputs influenced and shaped me. It was no different during this learning opportunity. I would like to thank my supervisor, Dr Maryke Mihai, for her guidance and quick responses. I would also like to thank my fellow students and other lecturers who guided me during this journey. I am very thankful to colleagues, friends and my family who supported me in this journey. Without the guidance and strength from my Heavenly Father, this would of course not been possible at all.

I would also like to acknowledge the NRF for their financial contribution that enabled me to complete this study. I feel privileged to have received the Masters Innovation Award.

This work is based on the research supported in part by the National Research Foundation of South Africa (Grant Number: 122619).

ABSTRACT

This study explored the digital didactical designs of four senior and FET language teachers at a private school. Participants collaborated within a Community of Practice during the study that served as a Teacher Professional Development opportunity, aimed at integrating technology into their teaching. The research design involved Collaborative Action Research for data gathering purposes. The phenomenon was represented as an explorative, descriptive case study. Data collection instruments included focus-group interviews, observations and documents based on the teaching practices of the participants.

The study employed a conceptual framework involving the *Digital Didactical Design* theoretical framework, surface and deep learning in relation to Bloom's Taxonomy, the Substitution Augmentation Modification Redefinition model as well as Teachers' ICT proficiency levels. Nine interviews, 24 observation sheets as well as lesson documents were analysed using content analysis and coding. During the study, all participants managed to present true digital didactical designs, especially during their second lessons. They gained an appreciation for and ability to integrate digital tools into their teaching practices. While the inputs of the Community of Practice were beneficial, the use of the *Digital Didactical Design* observation sheet was time-consuming and not user-friendly, although it contributed to teachers' designs. The study contributed a checklist for lesson design that applied the elements of *Digital Didactical Design,* as well as an updated observation sheet that can be used during oral reflections on lessons to determine teachers' digital didactical designs.

Key words: Digital Didactical Design; Language teaching; Teacher Professional Development; Community of Practice; Technology integration; Surface and deep learning

LANGUAGE EDITOR'S DISCLAIMER

I do hereby confirm that I have proof-read the dissertation entitled:

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Presented by: Annèl van Rooyen

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24 February 2021

Organisational Communication (Hons) (UNISA, 2007)

LIST OF ABBREVIATIONS

Abbreviation	Description
ASM	Assessment
CAR	Collaborative Action Research
CoP	Community of Practice
DDD	Digital Didactical Design
FET	Further Education and Training (i.e. grade 10 – 12)
ICTs	Information Communication Technologies
LA	Learning Activities
LMS	Learning Management System
LTSMs	Learning and Teaching Support Materials
MS Teams	Microsoft Teams
PQ	Primary research question
RO	Social roles
SAMR	Substitution Augmentation Modification Redefinition
SQ	Secondary research question
TAB	Web-enabled technologies
TG/ILOs	Teaching Goals / Intended Lesson Outcomes
TPACK	Technology, Pedagogy and Content Knowledge
TPD	Teacher Professional Development
URL	Uniform Resource Locator

CONCEPT CLARIFICATION

Term	Definition
2-in-1 device	A tablet with a stylist that enables more effective use of tablets for teaching (e.g. using MS Teams' whiteboard function).
Collaborative exploration	During this study, participants engaged in a Community of Practice established for the duration of the study. The community designed, observed, scored and reflected on lessons for tablet classrooms during two cycles of Collaborative Action Research whereby collaborative exploration occurred.
Constructive alignment	In the context of *Digital Didactical Design*, constructive alignment refers to the alignment of the teaching objectives, learning activities, assessment opportunities, social relations and the use of tablets to achieve the common goal of the lesson (Biggs, 1996; Jahnke, Svendsen, Zander, & Johansen, 2014b).
***Digital Didactical Design* vs digital didactical design**	*Digital Didactical Design* is a Scandinavian theoretical framework developed to describe teachers' designs for tablet classrooms (Jahnke, Bergström, Mårell-Olsson, Häll, & Kumar, 2017). In this study, participants' designed lessons for their tablet classrooms are called digital didactical designs. This use differentiates between the theoretical framework and participants' in-practice designs.
Microsoft Teams (MS Teams)	MS Teams enables schools to transform their classrooms into communities, where learning interaction can take place - just like in professional companies. It is advantageous that Microsoft Teams works well on any device, including tablets, laptops, desktops as well as online (Microsoft, 2020). Teams enable collaboration, organisation, and time efficiency (Bradbury, 2019). The study's participants identified possible apps that could be used in MS Teams in conjunction with tablets. These included Flipgrid; Kahoot; calendar; mind map apps; apps that monitor emotions; MS Forms (quizzes, surveys and polls); PollEverywhere, OneNote; MS Sway; MS Word, PowerPoint, Sway and Excel (collaboration).
Teacher Professional Development (TPD)	Teacher Professional Development involves ongoing training programmes to improve teachers' knowledge, skills (Bernadine, 2019; Oxbridge Academy, 2017) and attitudes (Steyn & Van Niekerk, 2002). TPD assists teachers in addressing their daily classroom challenges through engagement with a Community of Practice that plans and reflects collaboratively to improve classroom practices and learner achievement (Dlamini & Mbatha, 2018).

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CHAPTER 1. INTRODUCTION

1.1 Introduction

The more learners have personal mobile devices at their disposal, the more education needs to join the digital thinking of the day (Convergence Partners, 2020). Tablets are popular for educational settings since they are mobile devices offering the combined features of laptops and handheld devices (Jahnke, Norqvist, & Olsson, 2013). Tablets present an opportunity for the transformation of pedagogy and curriculum (Jahnke et al., 2017), but the extent of technology integration is largely dependent on teachers' integration levels (Kim & Kim, 2017).

Teachers often simultaneously admire the benefits of educational technologies like tablets while concerns about the negative effects of their use are also raised (Kalogiannakis, 2010). Teachers are faced with not only technical challenges, but also the necessity for new, alternative designs associated with teaching with tablets. The elements of *Digital Didactical Design (DDD)* used within a Teacher Professional Development (TPD) initiative have the potential to equip teachers with design principles and actions for tablet classrooms.

1.2 Background, rationale, and problem statement

1.2.1 Background

Information Communication Technologies (ICTs) like tablets, have the potential for interactive content, improved teaching practice, learner-centred classrooms, increased open access to information, increased student creativity, and collaboration possibilities, but the successful integration of ICTs into pedagogical designs needs addressing. TPD is vital to equip teachers with the necessary attitudes, knowledge and skills to truly implement ICTs effectively in their classrooms (Kalogiannakis, 2010).

1.2.2 Rationale

The researcher's interest in, and personal classroom experience of teaching with tablets were some of the main reasons for the study. While teaching Geography with tablets in the Further Education and Training (FET) band over the course of a year, she used tablets as e-books with added digital learning content. It was here that she realised the transformative potential of tablets in teaching. This interest stimulated her honours-level research on the barriers that teachers encounter during ICT implementation. To address these barriers, the researcher believes that the South

African education system can benefit from international trends, specifically those of Scandinavian countries. After investigating Scandinavian research on the use of tablets in the classroom, this study proposed the use of a Scandinavian theoretical framework, *DDD* to assist in addressing South African teachers' designs for tablet classrooms.

The focus of this study is on language teachers' designs since the researcher herself is also a qualified English teacher. The researcher's acquaintance at the target school is also a language teacher. This enabled a study focused on language teachers as the acquaintance recruited other language teachers who were willing to participate.

1.2.3 Problem statement

The *White Paper on e-Education in South Africa* (2004) hierarchically defines teachers' ICT proficiencies as ranging from entry-level computer literacy to innovative use of ICTs (Department of Education, 2004). Scandinavian countries, likewise, label these proficiency levels as teachers' "digital competencies" (Krumsvik, 2011, p. 44). The 2007 document *Guidelines for Teacher Training and Professional Development in ICT* sets the goal for all South African teachers to reach at least the *adoption* level of the framework, as seen in Figure 1-1 (Department of Education, 2007).

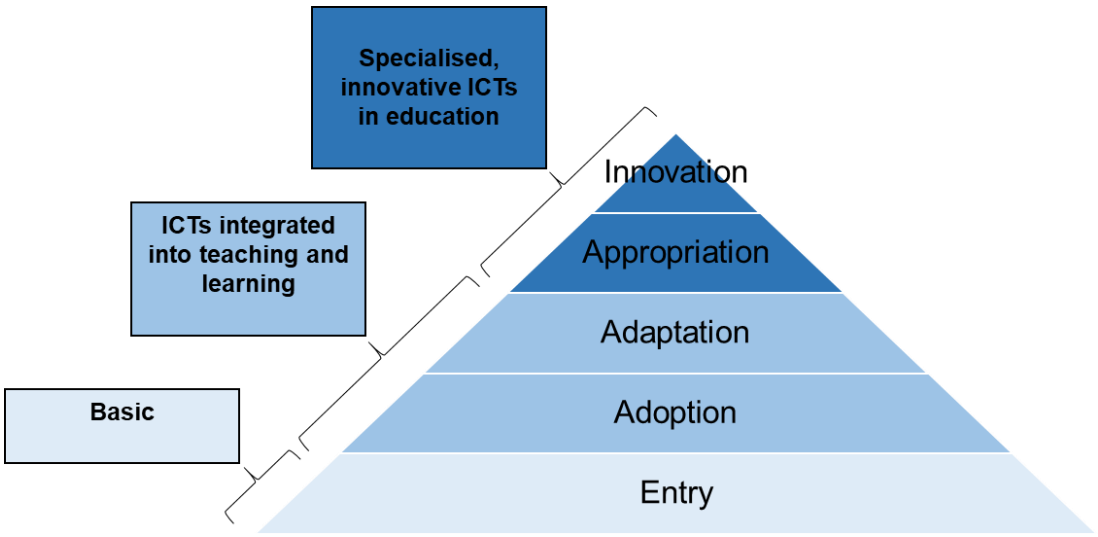


Figure 1-1. The integrated *South African Teacher Development Framework*

(Department of Education, 2007)

While this goal is set by the Department of Education, Ndlovu and Lawrence (2012) found that most South African teachers are still at the *entry* and *adoption* levels of the framework. Since 2017, the *Professional Development Framework for Digital Learning*

(Department of Basic Education, 2017) provides comprehensive guidance on the improvement of South African teachers' digital competencies. Teachers' competencies are expressed in three overarching categories containing 13 digital learning competencies as indicated in Figure 1-2. These competencies, as well as teachers' levels of technology integration, need to be addressed if South Africans are to adequately respond to the global digital challenges posed to education.

A. PROFESSIONAL GROWTH AND KNOWLEDGE	
1	Adapt the habit of an enquiring mind regarding the educational value of using digital tools and resources
2	Be reflective about challenging current digital learning and teaching practices
3	Understand the role of the teacher, the learner and the digital resources during digital teaching
4	Participate in local and global professional learning communities
5	Select appropriate digital tools and resources when fulfilling the roles of the educator
B. CURRICULUM FOCUS	
6	Integrate digital tools and resources to enhance learning objectives in various learning environments
7	Develop learners' global awareness and understanding using digital communication and collaboration tools
8	Transform learning through the innovative use of digital tools and resources
9	Enhance class management, assessment and feedback processes through the use of digital resources
10	Integrate learners' skills development in terms of digital literacies with curriculum-based learning
C. LEADERSHIP	
11	Demonstrate commitment to the vision for digital learning in the province, district and school
12	Accept responsibility for planning and implementing digital learning at the school
13	Initiate peer support and collaborative, work-place learning

Figure 1-2. 13 *Digital Learning Competencies* for South African teachers

(Department of Basic Education, 2017, pp. 15-19)

Schools are responding to the challenges of 21st century education. This study's research site, a private school in Pretoria, is a long-time user of tablets for learners, and since 2019 also Microsoft Teams (MS Teams). While there are pockets of excellence in technology application at the school, teachers have a need to be trained in the successful integration of tablets and MS Teams in their teaching. It is the challenges that teachers face that motivate their drive for TPD. These challenges can be categorised as hardware and/or technical challenges, and pedagogical challenges and were explored during the study.

1.3 Purpose of the study

The purpose of this study is in accordance with the beliefs of Tondeur, Forkosh-Baruch, Prestridge, Albion, and Edirisingha (2016, p. 110) that "merely providing ICT like tablets does not inevitably improve learning, but beyond access, it is how teachers

use ICT that makes a difference, and teacher professional development is crucial to achieving valued outcomes."

This study involved five people (i.e. the independent researcher and four participants who are two Senior phase and two FET band language teachers). The researcher is not a teacher at the school, but facilitated the research process. The other four participants, all from the same school, were two male participants who teach English Home Language and two female participants who teach Afrikaans First Additional Language respectively (cf. Table 3-3). All four of the teacher participants used tablets and MS Teams in their teaching. The study aimed to explore the design elements included in teachers' digital didactical designs. It also explored teachers' experiences of using the *DDD* observation sheet (cf. Heading 2.5) for lesson planning/design and observation. This observation sheet was introduced by Jahnke et al. (2017) and aims to study teachers' lesson designs for teaching and learning in tablet classrooms.

Furthermore, the cyclical lesson design, delivery and presentation was explored within the context of participants collaborating as Community of Practice members. The study investigated the extent to which the development of teachers' Digital Learning Competencies aided in addressing their challenges associated with designing for tablet and MS Teams classrooms.

1.4 Importance of the study

This study applied an international perspective (i.e. a Scandinavian theoretical framework) to the South African, private school and language classroom context. Participants gained an appreciation for well-designed lessons for tablet classrooms while constructing their lessons according to the principles of *DDD.* As participants engaged in a TPD opportunity, accompanied by their involvement in a CoP, their teaching practices were enhanced. The use of *DDD* in combination with TPD and CoP has neither been documented in an international nor in the South African context before.

The study's outputs have the potential to further enrich practice in the school on a wider scale. The study furthermore contributed a *DDD* checklist that can be used for lesson planning purposes. The *DDD* observation sheet has also been updated to be used during oral reflections on presented lessons.

1.5 Research questions

1.5.1 Primary research question (PQ)

How did cyclical planning with the *DDD* observation sheet influence language teachers' designs for teaching with tablets and MS Teams?

1.5.2 Secondary research questions (SQ)

SQ 1. What were the design elements of teachers' digital didactical designs?

SQ 2. What were teachers' experiences of using the *DDD* observation sheet to design and observe lessons for tablet teaching with MS Teams?

SQ 3. How did the CoP influence teachers' digital didactical designs for tablet teaching with MS Teams?

SQ 4. To what extent did the study's goal to develop teachers' *Digital Learning Competencies* assist to address their challenges of teaching with tablets and MS Teams?

1.6 Overview of the literature study

The literature study had several foci. It started off with an exploration of the challenges and advantages of teaching and learning with tablets. It then explored designs for tablet classrooms and distinguished among replicating, transformative and Digital Didactical Designs. A short description of the teaching of languages with tablets followed.

Based on the variety of designs found in tablets classrooms, the study then explored the levels of technology integration in the literature. Since existing frameworks and models depict teachers' levels of technology integration, the literature study continued into an exploration of four frameworks and/or models that illustrate these levels. The *DDD* framework was then introduced in detail since this formed the foundation of the study's conceptual framework. As levels of technology integration need addressing in practice, the literature study then continued to explore TPD and CoP to be included in the study's design. After the conceptual framework was introduced, the gaps in the literature were identified.

1.7 Theoretical frameworks

The researcher regarded the *DDD* framework as valuable for implementation in a local context, since it enables teachers to design for learning and teaching while integrating

digital tools, specifically tablets (Jahnke et al., 2017). Surface and deep learning, the Substitution Augmentation Modification Redefinition (SAMR) model, and teachers' ICT proficiency levels are embedded in *DDD*. The researcher extracted surface and deep learning to be studied in terms of the cognitive levels of Bloom's taxonomy as combined by Jahnke, Norqvist, and Olsson (2014a). The SAMR model of Puentedura (2006) with its levels of digital tool integration as well as teachers' ICT proficiency levels (Department of Education, 2007) addressed the study's need for a focus on technology integration levels.

1.8 Conceptual framework

The study's conceptual framework is included in Figure 2-12. It indicates how the study focused on teachers' digital didactical designs, their levels of technology integration, and the context in which they teach. This framework guided the study's questions and planning throughout the entire process.

1.9 Research design

The study's research design is visually presented in Figure 3-2. The study was a phenomenological study that explored the phenomenon of teachers' digital didactical designs and experiences of a TPD opportunity and CoP. The paradigm of the study is illustrated in Figure 3-3 and included an interpretivist ontology and socio-constructivist epistemology, since phenomenology, interpretivism and socio-constructivism go hand in hand (Adams & Van Manen, 2012). The inductive approach enabled patterns to emerge from the data (McLaren, 2012) and supported the qualitative methodology well. The study employed Collaborative Action Research (CAR) to enable data gathering, while the study was represented as an exploratory and descriptive case study to enable detailed exploration of the case (Stewart, 2017). The study's sample included four language teachers from the same school. These participants were willing to participate in the study because of their interest in a TPD opportunity aimed at teaching with tablets and MS Teams. The study used observations, interviews, and documents for the data gathering and these sources were analysed using content analysis and coding.

1.10 Delineation of research

This study was conducted at one target school. The four language teachers who were the study's participants were accessed via online software (i.e. Blackboard

Collaborate). No physical contact or school visits were allowed due to Covid-19, therefore all interviews and observations were done online and recorded. All documents were also made available electronically.

1.11 Ethical considerations

This study's adherence to the University of Pretoria's ethical requirements is illustrated in Figure 3-15. After obtaining ethical clearance from the University's ethics committee, the researcher obtained informed consent from the school group's CEO, the school principal, the four participants and all learners' parents (all learners were younger than 18 years). Participants were ensured that they could leave the study at any time while their identities were also protected.

1.12 Outline of the dissertation

Chapter 1 provides the study's context and purpose. It also supplies the reader with an overview of the literature study, the study's methodology and the adherence to ethical practices.

Chapter 2 contains the literature most relevant to the study's context and purpose. It starts off with challenges of teaching with tablets, and then explores designs for tablet classrooms, levels of technology integration and frameworks/models with which to study these levels. The study then turns towards TPD and CoP as vital elements included in the design of this study. This is followed by an introduction to the study's conceptual framework after which the gaps in the literature are identified.

Chapter 3 elaborates on the methodology used for this study. It employs both content from the literature and the application of the literature in the study's practice.

Chapter 4 presents the multitude of results obtained during the study. Findings as related to the literature are also included.

Chapter 5 concludes the research report by indicating how the research questions were addressed during the study. The limitations of the study, some recommendations and concluding remarks round off the study.

The study's chapter layout is illustrated in Figure 1-3.

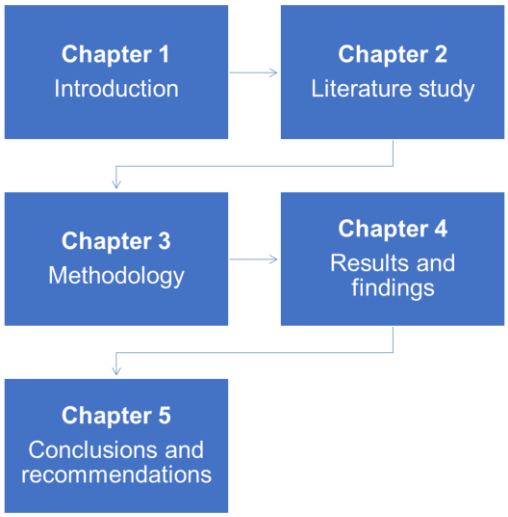


Figure 1-3. Outline of the study's chapters

1.13 Conclusion

This chapter provided the study's background, rationale and problem statement that inform the purpose of the study. The study's purpose was further expressed in the presentation of the research questions that guide the study. An overview of the literature study, theoretical and conceptual frameworks, and the research design were included. The study was delineated, and ethical considerations were briefly dealt with. Finally, the contents of the chapters in the study were provided.

CHAPTER 2. LITERATURE STUDY

2.1 Introduction

Globally, schools are investing in tablets for teaching and learning. This literature study sets out to provide an in-depth picture of tablets as widely preferred educational technology. Figure 2-1 provides an overview of chapter 2, that also includes the themes of the literature study. The study starts off with a broad discussion of the advantages and challenges associated with teaching and learning with tablets. Next, insights from the literature in terms of designs for teaching and learning in tablet classrooms are explored. Based on the different designs, various frameworks and/or models for the levels of technology integration are introduced, compared, and contrasted. Since this study is aimed at TPD, international and national TPDs are explored to provide further insight. Lastly, in the narrowest sense, the CoP as element of the TPD aimed at teachers' digital didactical designs is explored. After the presentation of the study's conceptual framework, the gaps in the literature are identified.

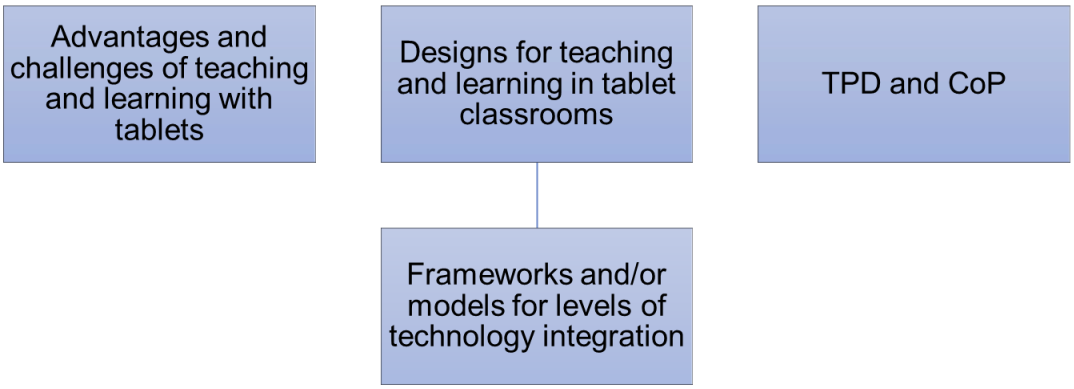


Figure 2-1. Overview of Chapter 2

2.2 The advantages and challenges of tablets in education

The educational use of tablets holds advantages and challenges for both teaching and learning. Tablets benefit teaching in four domains and learning in another two domains as depicted in Figure 2-2.

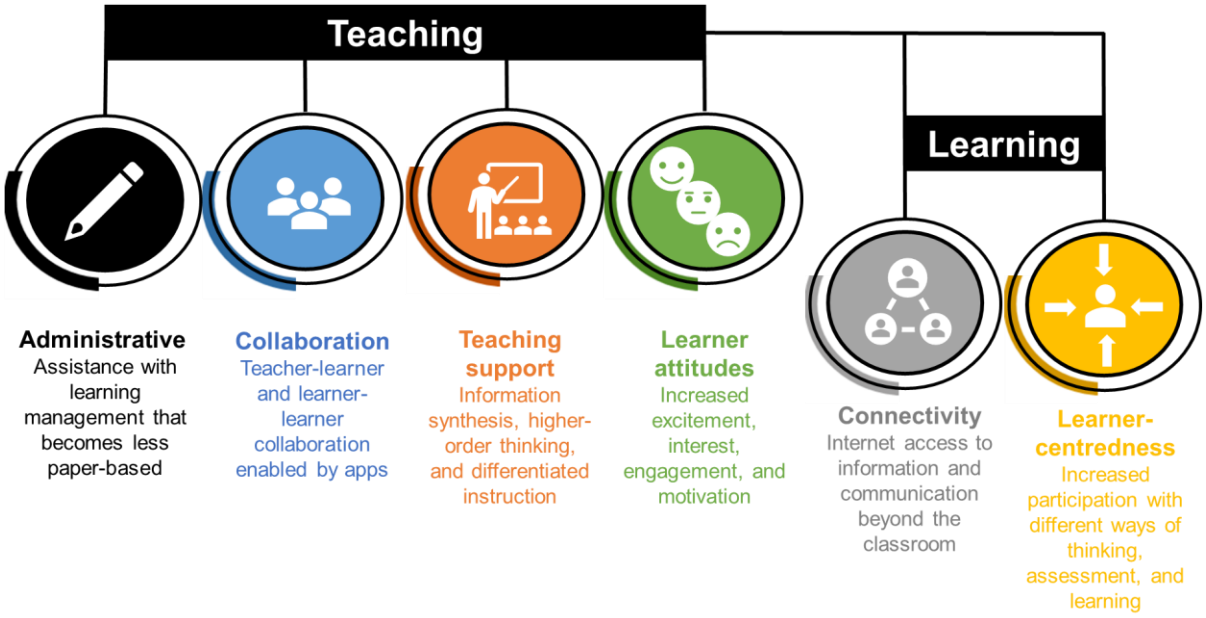


Figure 2-2. Advantages of tablets for teaching and learning

In terms of teaching administration, tablets assist with learning management through easier access to assignments, grades, and easy parent communication (Raney, 2018). Tablets enable the management, creation and/or documenting including scheduling, taking of photos, notes or videos as well as use for assessment and reflections (ChanLin, 2017). Tablets also enable decreased paper usage through online assignment submissions (Raney, 2018), less photocopying, (Eicker-Nel & Matthee, 2014) and by e-books replacing hardcopy books (Jahnke et al., 2014b).

Tablets can promote collaboration among learners (Kim & Kim, 2017; Zhang & Nouri, 2018), especially when using apps (Karchmer-Klein, Mouza, Shinas, & Park, 2017). 42% of 171 Finnish teachers indicated tablets' collaborative potential for learning (Rikala, Vesisenaho, & Mylläri, 2013), while only 35% of Danish teachers acknowledged tablets' collaborative assistance (Jahnke et al., 2014b). According to Raney (2018) and Montrieux, Vanderlinde, Schellens, and De Marez (2015), teachers appreciate tablets' potential for teacher-learner and learner-learner collaboration as well as peer-consultation (Montrieux et al., 2015).

Teachers find that learners learn to synthesise information across apps while using tablets (ChanLin, 2017). Rote-learning is also replaced by negotiated content and higher-order thinking (Montrieux et al., 2015). Tablets enable differentiated instruction

(Raney, 2018), although they are poor distinguishers among struggling and performing learners (Rikala et al., 2013).

In terms of learner attitudes, the learner-centredness of tablet teaching excites teachers (Maboe, Smith, Banoobhai, & Makgatho, 2018) and learners, thereby creating higher interest levels in subjects (ChanLin, 2017; Eicker-Nel & Matthee, 2014; Montrieux et al., 2015). Learners display increased attention and engagement levels (ChanLin, 2017), and feel more motivated (Kim & Kim, 2017; Maboe et al., 2018), to such an extent that they barely realise that they are learning (Raney, 2018).

In terms of tablets for learning, learners are so comfortable with tablets (Eicker-Nel & Matthee, 2014) that they find the use of these devices non-threatening (Raney, 2018). Learners also gain increased internet connectivity that enables them to access information, create knowledge and communicate (Rikala et al., 2013). They manage to discover new things in worlds beyond their own realities (Raney, 2018), thereby expanding their learning environments beyond the classroom (Rikala et al., 2013).

Tablet teaching is also learner-centred with increased learner participation, control, evaluative activities and interaction (Rikala et al., 2013). Learners are actively engaged in a wide variety of ways in thinking and learning (ChanLin, 2017), while their own worlds are included as well (Montrieux et al., 2015). Tablets enable alternative assessments, group-based learning, access to alternative sources of information (Kopciewicz & Bougsiaa, 2018), and opportunities to develop problem-solving skills (Maboe et al., 2018).

The challenges associated with teaching with tablets are summarised in five domains for teaching and a sixth domain for learning as depicted in Figure 2-3. In general, tablets introduce other challenges, whereby teaching is not always easier (Jahnke et al., 2014b). Teachers experience that their pedagogy needs changing which requires many hours spent on lesson planning (ChanLin, 2017) for extensive course redesign (Montrieux et al., 2015). Not all teachers are willing to change their pedagogy. Only 50% of Danish teachers transformed their pedagogy, while 40% lacked the skills and 10% omitted tablet use (Jahnke et al., 2014b).

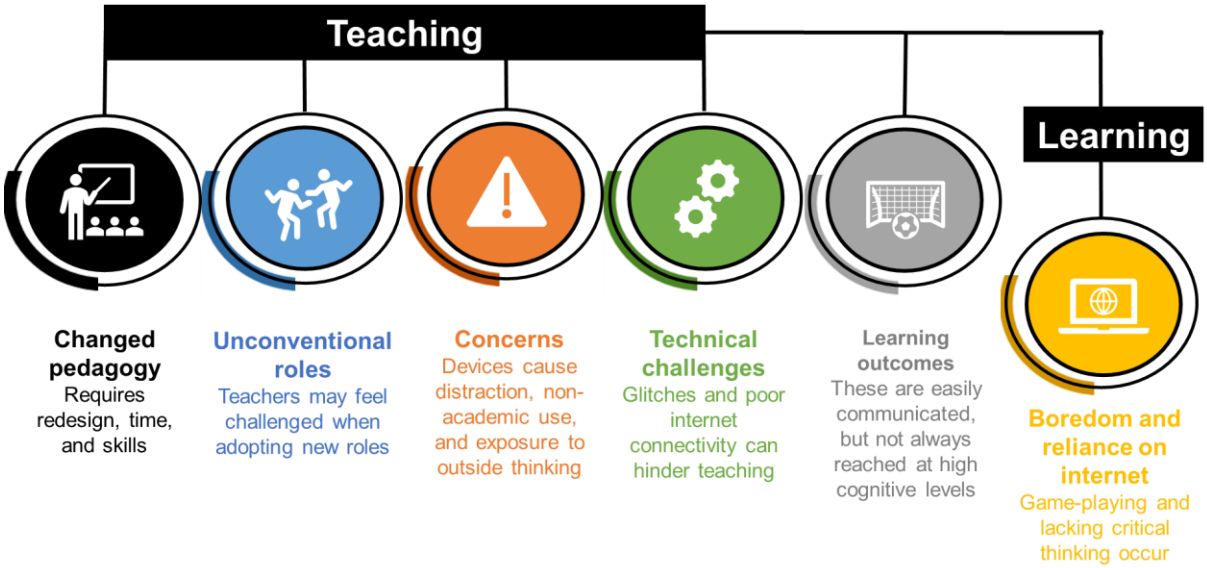


Figure 2-3. Challenges of tablets for teaching and learning

Except for changed pedagogy, tablets enable teachers to assume unconventional roles, yet teachers are reluctant to forfeit the control of their classrooms (Montrieux et al., 2015). These roles include instructional designers, trainers, team players, coordinators, advisors, monitors (Groff & Mouza, 2008), the student role (Bowman, 2004), as well as facilitators (Kalogiannakis, 2010). While adopting these roles, teachers experience both exhaustion and feelings of interest in these roles (Montrieux et al., 2015).

Teachers are concerned by devices that cause distraction (Montrieux et al., 2015) or decreased attention (Kim & Kim, 2017), yet paper notes sent around in class have been an ever-present distraction in classrooms (Jahnke et al., 2014b). Furthermore, learners' portray a poor ability to distinguish between tablets' recreational and academic uses (Jahnke et al., 2014b). Yet, as learners become accustomed to the academic use of tablets, this distinction becomes clearer (Jahnke et al., 2014b; Kopciewicz & Bougsiaa, 2018). Teachers find it worrisome that learners can be exposed to inappropriate materials while using the internet (Montrieux et al., 2015).

Teachers often encounter technical challenges like glitches that require teacher improvisation or even digital tool omittance, causing frustration (Raney, 2018). While technically skilled teachers persist, the less-skilled get demotivated under such circumstances (Jahnke et al., 2014b). Poor internet connection and the network

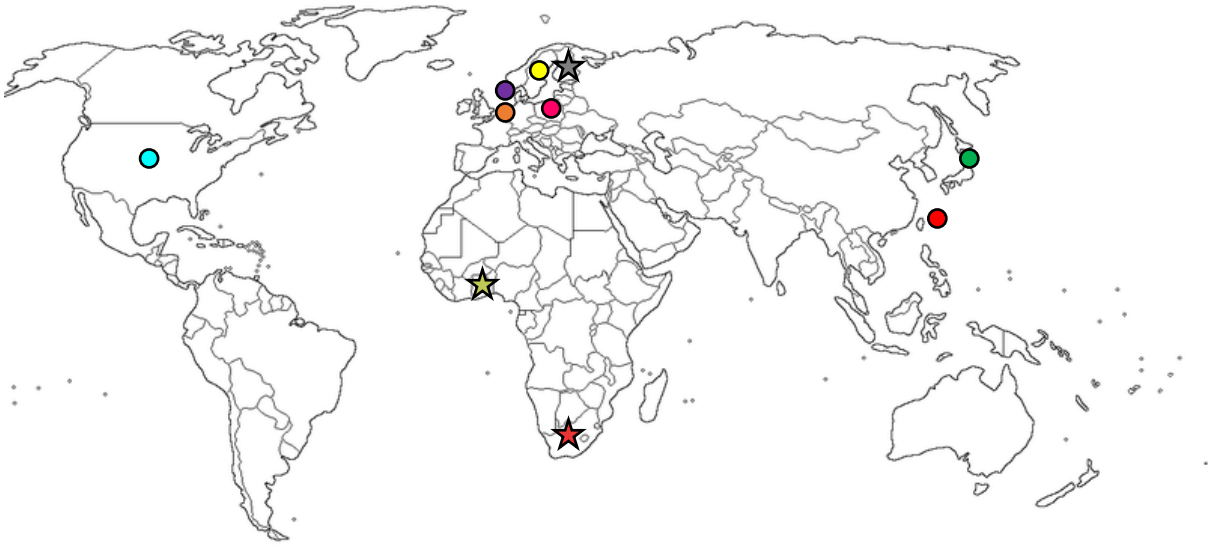
expenses involved (Jahnke et al., 2014b) are also technically-related challenges experienced by teachers.

In terms of learning outcomes, these are more easily communicated using tablets (Jahnke et al., 2014b), but teachers struggle to reach their outcomes for tablet classrooms (Kim & Kim, 2017). 21% of Finnish teachers believe that tablets support independent learning, while only 13% believe that tablets support problem-solving skills (Rikala et al., 2013). Instead, learners revert to games due to teachers' limited control of the learning activities or boredom during repetitive tablet activities. Another concern related to outcomes, is that learners tend to rely on internet answers without engaging in critical thinking (Raney, 2018).

2.3 Designs for teaching and learning in tablet classrooms

Tablets either replicate existing educational practices or transform learning and teaching. Tablets used as electronic textbooks replicate existing practices, while the use of open educational resources, active learning strategies and reflective learning transform the educational setting (Jahnke et al., 2014b). In a Danish study by Montrieux et al. (2015), two thirds of the 18 teachers included in the study were classified as "instrumental teachers" who used tablets as electronic textbooks without altering their roles or didactics (or pedagogy). One third of these teachers were deemed "innovative teachers" who changed their roles and didactics (Montrieux et al., 2015, p. 7). Ideally, teachers prefer a balance between tablet use as well as other teaching and learning materials (Jahnke et al., 2014b).

Practice-based examples of replicational and transformational uses of tablets are provided in the following sections based on the geographical locations illustrated in Figure 2-4.



Replicating practice		
Colours	**Countries**	**Number of studies**
☆	Finland	1
★	South Africa	2
★	Ghana	1

Transforming practice		
Colours	**Countries**	**Number of studies**
●	Denmark	2
●	Taiwan	1
●	Belgium	1
●	Korea	1
●	Poland	1
●	USA	2
●	Sweden	1

Figure 2-4. Geographical locations of designs for tablet classrooms

(Wikimedia Commons, 2017)

2.3.1 Tablet integration replicating existing educational practices

Finnish instrumental teachers utilise tablets for information searches and lesson material presentation (e.g. videos and presentations) (Rikala et al., 2013). In rural Eastern Cape, tablets are used likewise, but only by the teachers (Phiri, Foko, & Mahwai, 2014). These teachers also participate on social media, access emails, and use the devices to take pictures, videos, and sound clips. They find few relevant apps that can support their learning content at age-appropriate levels or teaching. In another South African school, the private school utilises tablets for controlled internet access whereby learners gain an awareness of the value of other information sources apart from their e-textbooks (Eicker-Nel & Matthee, 2014). In a study in Ghana, mathematics teachers keep to direct instruction, but desire training in the use of familiar tools readily available on mobile devices (Agyei & Voogt, 2011).

2.3.2 Lesson designs transforming existing educational practices

Tablets unlock prospects of new learning, but teachers need to redefine and redesign their pedagogies for this to occur (ChanLin, 2017). Teachers also need to structure their redesigned instructional and learning events to elicit opportunities for deep learning. This necessitates transformed teacher and learner roles, as well as classroom activities with offline and online resources (Jahnke et al., 2017).

In the study by Montrieux et al. (2015), a third of Danish teachers are innovative in their use of tablets. The learning activities involve assistance to learners to unlock knowledge, leaving room for mistakes, fostering learner creativity and the challenging of learners (Jahnke et al., 2014b). In 32 Taiwanese schools, teachers train their learners as peer technical assistants, while both teachers and learners embark on independent discovery of apps (ChanLin, 2017).

Innovative Belgium teachers change their roles to that of coaches, while altering their didactics and learning activities (Montrieux et al., 2015). In rural Korean schools, 54 teachers develop learners' problem-solving skills, while also hosting virtual simulations of science experiments (Kim & Kim, 2017). As in the Korean schools, a Finnish Physical Sciences teacher uses different apps to explain concepts to learners (Rikala et al., 2013). The Finnish Biology teachers use tablets to heighten learner engagement and motivation through learners' photos, presentations, fieldtrips, and questionnaires.

Six Polish teachers initially keep to direct instructional methods, despite the inclusion of videos and presentations. After prolonged engagement, however, learners become knowledge creators by accessing a wider spread of information sources (not only the textbook), and by working increasingly independently. Teachers become consultants and facilitators, allowing learners to practice their own sense of agency (Kopciewicz & Bougsiaa, 2018).

In the study of nine American middle school teachers by Karchmer-Klein et al. (2017), the teachers utilise 27 apps, the flipped classroom teaching strategy, simulated events in video format, games, and internet textual materials with some paper-based activities as well. These teachers maintain the balance of technology and paper-based sources as described in Jahnke et al. (2014b).

An elementary school teacher in New York City combines pictorial matter, learners' handwriting, audio recordings, and videos made by learners to create a global

collaborative reading programme. As learners read books from around the world, they connect with people from around the world through social media (Daccord & Reich, 2015).

In Danish and Swedish classrooms, teachers' digital didactical designs (i.e. pedagogical designs for tablet classrooms) are studied (Jahnke & Kumar, 2014). In a 7th grade classroom of Danish language instruction, learners use their iPads and a variety of apps to write childhood stories, receive peer feedback, and then finalise their writings for submission. The grade 9 Physics teacher has learners showcase their knowledge by designing their own new experiments in groups. Learners take photos, videos, and made audio recordings to document the planning and execution of their experiments. They also consult the internet and their e-books. Both these Danish teachers promote active as well as reflective learning. Learners are producers and participated in formative, learner-centred assessments (Jahnke & Kumar, 2014).

Swedish teachers' changed didactics involve the desentralisation of the selection of curriculum content (i.e. this is now in the hands of the teachers), and teachers have to incorporate one-to-one computers in their teaching (Bergström, Mårell-Olsson, & Jahnke, 2017). Due to these changes, teachers become designers and increased learner control occurs. As learners become content producers, they engage in a collegial relationship with the teacher.

2.3.3 Lesson design as *Digital Didactical Design*

Jahnke et al. (2014b) studied Scandinavian teachers' designs for tablet classrooms, which form the foundation to the work of developing the *DDD* framework. The factors that influence the framework design include teachers who work on their own or in a collaborative fashion with other teachers, teachers' balancing of the different elements of *DDD,* teachers' designs in terms of elements considered, as well as unplanned elements. The authors find the design for tablet classrooms to be a complex activity, since technology use, teachers' design abilities, and ways in which learning activities and social interaction need to be facilitated by tablets are important (Jahnke et al., 2014b).

Some of the first research using *DDD* as research framework, investigates the lesson designs of teachers from Denmark who adopted tablets for learners from the onset of the tablet project. These studies show that early tablet-adopters do not merely accept

tablets as yet another teaching tool, but rather reconsider their learning goals, established pedagogies and the level of learner-centredness of their classrooms (Jahnke et al., 2017).

Successive studies enable researchers to illustrate different teachers' digital didactical designs based on the *DDD* framework (Jahnke et al., 2017). Based on 64 classroom observations done in seven Danish, seven Swedish and two Finnish schools, three clusters of teachers' digital didactical designs are identified by Jahnke et al. (2017), included and explained in Table 2-1. All classroom practices are not true digital didactical designs as can be seen in the clusters. Cluster C represents didactical designs without sufficient exploitation of the advantages for learning of web-enabled technologies like tablets in the classroom (Jahnke et al., 2017).

Table 2-1. Three clusters of Scandinavian teachers' digital didactical designs

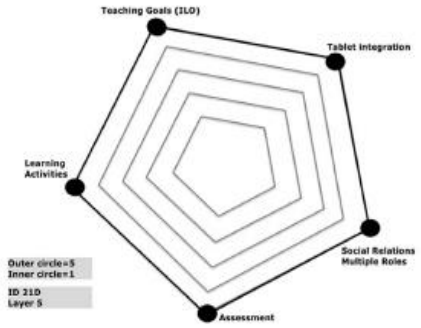
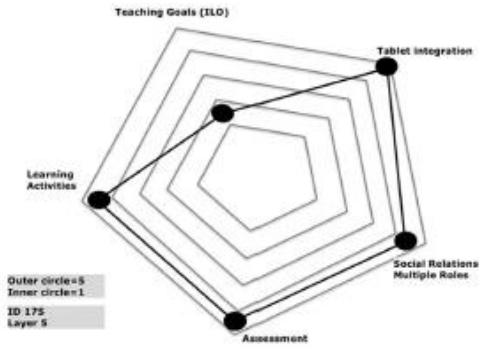
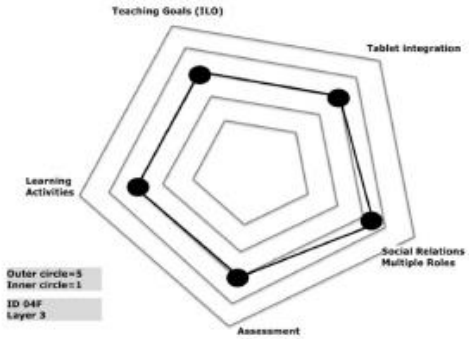
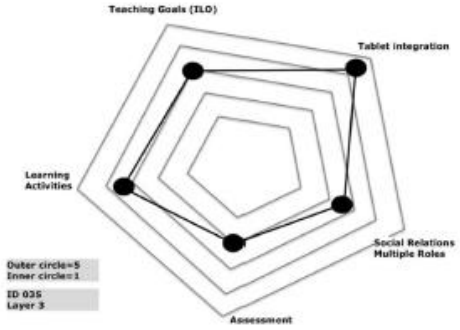
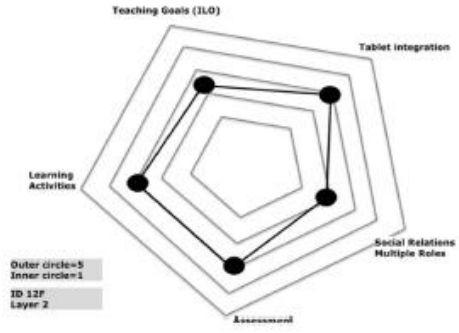
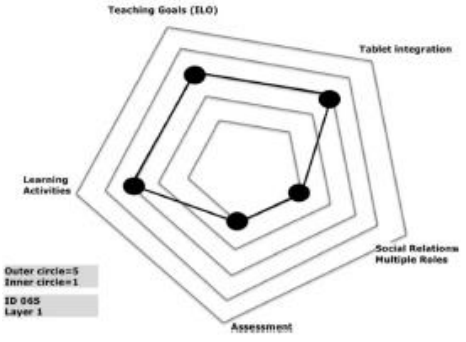
(Jahnke et al., 2017)

	Cluster A *Deep, meaningful digital didactical designs*	**Cluster B** *Semi-integrated digital didactical designs*	**Cluster C** *Shallow / entirely lacking integration digital didactical designs*
Teaching goals	Goals are clear and accessible for learners, mostly electronically.	Goals are rather clear, but communicated orally, not electronically.	Goals are unclear and inaccessible to learners.
Learning activities	Meaningful learning through content creation and reflection (limited remembering).	Ranging between shallow and deep learning with tendency towards deep learning.	Questions with single answers exchanged between teachers and learners. Learners do not create nor collaborate. Some classes have starting elements of meaningful learning.
Assessment	Process-based assessment with formative feedback and assistance to all learners.	No process-based assessment with random, unequal formative feedback.	No process-based or formative assessment, but some intents of formative assessment are visible.
Roles	Teachers and learners assume different roles. Learners: Content creators; Teachers: Experts and learning partners	Learners are mainly content consumers; teachers are mainly experts, technology assistants and only seldomly mentors.	Learners are only consumers and teachers are experts who convey content.
Tablet integration	Generic apps that are not limited by subject content. Tablets provide new learning opportunities, not only electronic textbooks. These digital didactical designs are impossible without tablets	The device is used as substitution for other typewriters like laptops; Features not explored in depth.	Tablets replace stationary technologies. The aim of using apps is unclear and not truly purposeful.

Based on scores of one to five on the *DDD* observation sheet, teachers' digital didactical designs can be represented as radar charts. Table 2-2 includes both typical and atypical forms (Jahnke et al., 2017).

Table 2-2. Typical and atypical digital didactical designs

(Jahnke et al., 2017)

	Typical digital didactical design	**Atypical digital didactical design**
Cluster A Deep, meaning-ful digital didactical designs		
Cluster B Semi-integrated digital didactical designs		
Cluster C Shallow / entirely lacking integration digital didactical designs		

2.3.4 Teaching languages with tablets

While a wide variety of designs for tablet classrooms exist, one international and two local examples of language teaching with tablets are provided. Raney (2018) looks at the instructional methods of 12 American middle school teachers while using tablets

to teach content vocabulary. These teachers access online resources, apps, and their Learning Management System (LMS) in support of tablet lessons. Teachers accredit some of their success to the immense number of online resources available, as well as their skills to select the most appropriate resources for their educational settings. These teachers stress a point: While tablets prove to be advantageous for vocabulary building, devices cannot replace teachers and their direct instruction. Teachers' verbal explanations and provision of direction in the learning contribute to successful student learning, therefore a combination of tools and teacher talk is used.

In a South African study on the use of tablets to enhance reading of grade 5 learners, Maboe et al. (2018) account for language teachers' use of tablets for reading as a way of staying up to date with the technological advancements. The teachers in the study make use of audiobooks to improve learners' reading. The audiobooks are advantageous because they allow for replaying, listening, doing different things while busy with the audiobooks, and entertainment as well. Teachers' preparations for the use of the tablets include the selection of reading material, charging of tablets, and setting up of questions for learners. While teachers use tablets to stimulate reading and make it a more interesting experience, the study's recommendations refer to the need for proper training for teachers to promote more effective use of audiobooks in the classroom.

Mthelebofu (2018) compares South African English Home Language teachers' use of tablets and the ITSI e-textbook platform. The teachers in the study use tablets to access e-textbooks, and provide learners access to notes, PowerPoint presentations, and YouTube videos via the ITSI platform. Tools like *Kahoot!, WhatsApp* groups, *Twitter*, as well as *Google Drive* for the sharing of documents are used. Specific learner activities included the following: Learner speeches that incorporate multimedia via laptops or tablets, learner videos to showcase definitions and examples of selected parts of speech, as well as group mind maps shared on the platform as photos. While teachers incorporated the use of tablets in different ways, a need for increased use of tablets for assessment purposes is raised.

2.4 Levels of technology integration and technical skills

The literature study has thus far illustrated how the use of digital tools like tablets either replicate or transform current teaching practice. In terms of tool integration, Daccord

and Reich (2015) find that teachers usually start off with a replication of existing practices, and then progress to increased use of different tools. Seeing that teachers are the drivers of educational change in terms of technology integration (Department of Education, 2004), various frameworks depict teachers' levels of technology integration as well as their professional competencies and technical skillsets.

Five levels of technology integration are identified by Sandholtz, Ringstaff, and Dwyer (1997) namely *entry, adoption, adaptation, appropriation* and *invention*. Since different countries adopt different terms and frameworks to express their teachers' technology competency levels, the South African and Scandinavian frameworks are compared.

In the South African context, teachers' competencies are hierarchically arranged in the *Integrated Teacher Development Framework* in Figure 2-5. The framework expresses teachers' level of ICTs competence (Sandholtz et al., 1997) and integration with brief descriptions. These competency levels are the digital tool goals for both teacher graduates and in-service teachers. Teachers graduating from colleges and universities are expected to have reached at least the *adoption* level, while in-service teachers ought to undergo training to reach the *adoption* level (Department of Education, 2007).

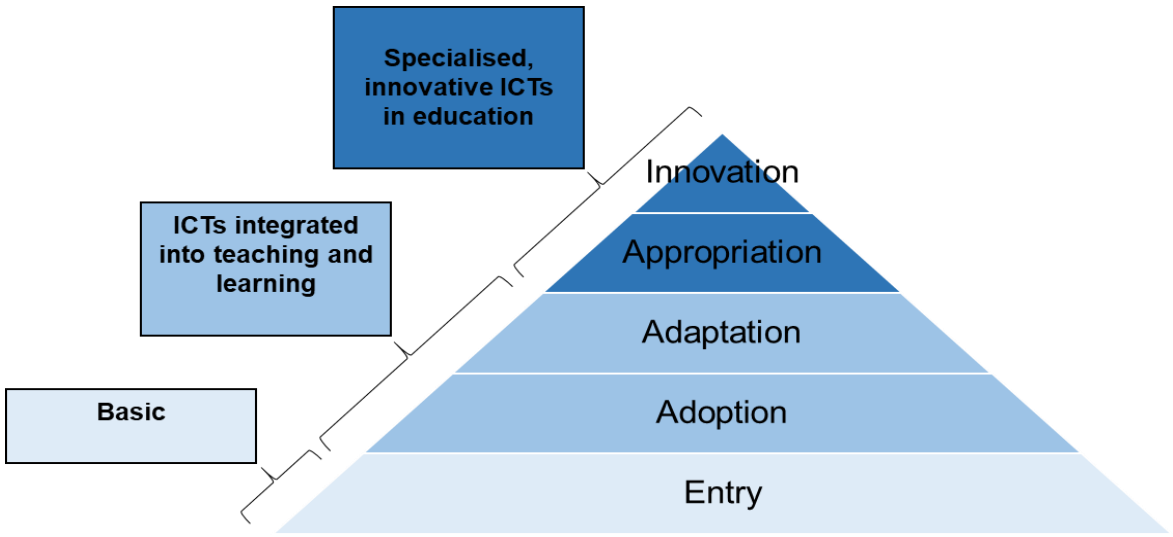


Figure 2-5. The *Integrated Teacher Development Framework*

(Department of Education, 2007)

For Scandinavian countries, the levels of technology integration are termed *Teachers' Digital Competencies* and visually represented by Krumsvik (2011) in Figure 2-6. This framework is much more comprehensive than the South African Integrated Teacher

Development Framework, but uses only four of the five levels of technology integration by Sandholtz et al. (1997).

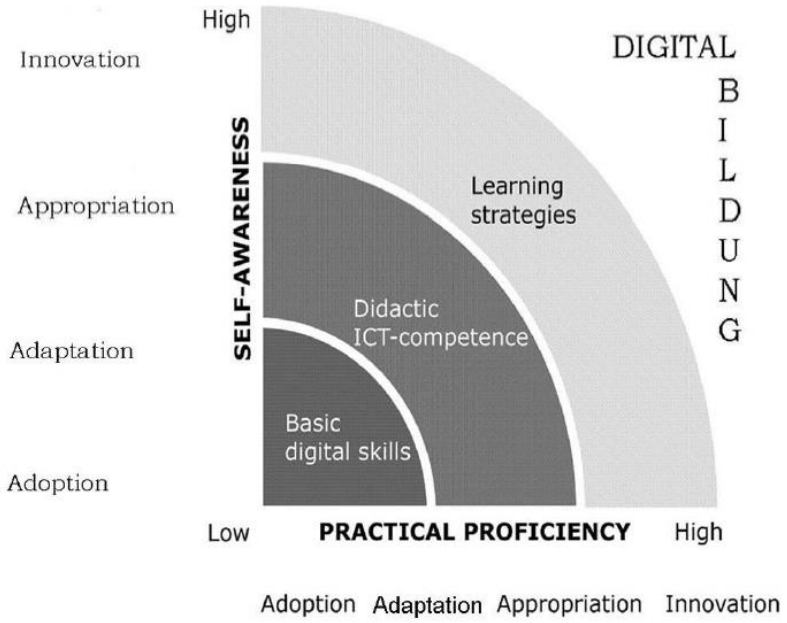


Figure 2-6. *Teachers' Digital Competencies* model

(Krumsvik, 2011)

The *Technology Integration Matrix* (TIM) (Florida Center for Instructional Technology, 2020) and the *Substitution Augmentation Modification Redefinition* (SAMR) model (Puentedura, 2006) use some of the same terms of the hierarchical classifications of other frameworks already discussed. Due to the variety of frameworks, a comparison of the terms used to express levels of technology integration proves to be insightful, as included in Table 2-3.

Table 2-3. Levels of technology integration across several frameworks

(Department of Education, 2007; Florida Center for Instructional Technology, 2020; Krumsvik, 2011; Puentedura, 2006)

	Levels of technology integration (Sandholtz et al., 1997)	**TIM Five levels of technology integration** (Florida Center for Instructional Technology, 2020)	**Teachers' digital competency model** (Krumsvik, 2011)	**Integrated Teacher Development Framework** (Department of Education, 2007)	**SAMR model** (Puentedura, 2006)
Level 1	Entry	Entry	-	Entry	-
Level 2	Adoption	Adoption	Adoption	Adoption	Substitution
Level 3	Adaptation	Adaptation	Adaptation	Adaptation	Augmentation
Level 4	Appropriation	Infusion	Appropriation	Appropriation	Modification
Level 5	Invention	Transformation	Innovation	Innovation	Redefinition

Level 1 (*Entry*) entails traditional, teacher-centred classes with mainly textual materials such as an overhead projector, the chalkboard, textbooks, and learners' workbooks. Teachers use their traditional methods alongside technology, but encounter disciplinary and technical issues (Sandholtz et al., 1997). Teachers have basic computer literacy, but still experience high levels of frustration and poor self-confidence (Department of Education, 2007). For *TIM,* teachers start attempting digital tool use to deliver learning content (Florida Center for Instructional Technology, 2020). The *SAMR* model as well as the *Teachers' digital competency model* by Krumsvik (2011) does not provide for teachers' low-level use of ICTs, but starts off with level 2 (*adoption*).

Level 1: Conglomerate definition

Teachers use digital tools to an extremely limited extent to deliver content, while still teaching in traditional ways.

In level 2 (*Adoption*), teachers consider technology integration more often, but are still focused on direct instruction aimed at the entire class (Sandholtz et al., 1997). Teachers start using a variety of ICTs to support different tasks, including traditional teaching, management and administration (Department of Education, 2007). Teachers start to transfer their basic ICT skills to learners (Department of Education, 2007; Florida Center for Instructional Technology, 2020; Sandholtz et al., 1997). Teachers manage technical problems with their basic technical problem solving skills (Sandholtz

et al., 1997). *TIM*'s definition of level 2 (Florida Center for Instructional Technology, 2020) corresponds to that of the Department of Education (2007) and Sandholtz et al. (1997). The first *SAMR* level to correspond to the levels of Sandholtz et al. (1997) is *Substitution*. The ICTs are included as substitutes for traditional tools, without changing their primary functionality (Puentedura, 2006). While the older technologies' use is significantly decreased or even disappears, the same kinds of activities are executed with more recent ICTs.

Level 2 corresponds to three models in name (i.e. *TIM*, *Teachers' Digital Competency* and *Integrated Teacher Development Framework*) and in meaning across all five models.

Level 2: Conglomerate definition

Teachers use ICTs to perform traditional tasks. They can assist learners with ICT usage and do some basic technical troubleshooting.

According to Sandholtz et al. (1997), level 3 (*Adaptation*) entails predominantly traditional teaching, while digital tools are used to assist learners in producing their own materials. *Adaptation* for the Department of Education (2007) allows teachers to increase their productivity through digital tools. Essentially, the technology's presence changes how management and administration are done. Teachers also possess the knowledge and skills to support classroom activities, assessment, and learner progression with technology. *TIM*'s adaptation level describes teachers who assist learners to explore and use tools on their own (Florida Center for Instructional Technology, 2020).

Once again, three models label level 3 likewise (i.e. *TIM, Teachers' Digital Competency* and *Integrated Teacher Development Framework*). Augmentation of the *SAMR* model entails ICTs replacing other tools and creating functional changes in the educational context (Puentedura, 2006).

Level 3: Conglomerate definition

Teachers and learners use ICTs productively to create materials for teaching, learning, and administrative purposes.

In level 4 (*Appropriation*), teachers have gained an appreciation for the use of technology. They now not only use technology more frequently, but also include more student-centred activities such as student-student and student-computer interactions. Learning is focused on projects, while collaboration and creativity start to surface in classroom schedules (Sandholtz et al., 1997). The use of new strategies as referred to by Sandholtz et al. (1997) is also expressed in the description of level 4 by the Department of Education (2007). In fact, technology has become an integral element of the educational setting. While the *Teachers' Digital Competency Framework* and *Integrated Teacher Development Framework* use the same label for level 4, *TIM*'s level 4 is labelled *Infusion*. *Infusion*-level teachers create the context for learner choice in technology use (Florida Center for Instructional Technology, 2020). In level 3 of the *SAMR* model (*Modification*), both learning and teaching tasks are redesigned through ICTs (Puentedura, 2006).

Level 4: Conglomerate definition

Technology is used in new ways, and more frequently used by learners who have some form of choice.

Level 5 (*Invention*) describes teachers who feel free to experiment with technology and new methods of instruction. Relationships between learners and teachers change as learners gain autonomy as well as skills in reflection and collaboration (Sandholtz et al., 1997). Level 5 is called *Innovation* in two frameworks (i.e. *Teachers' Digital Competency* framework and *Integrated Teacher Development Framework*). Innovative teachers, according to the Department of Education (2007) redefine learning experiences to be collaborative and interactive in ways that reap the most benefits possible for the ICTs at the school's disposal. On *TIM*, level 5 is classified as the *Transformation* level since technology is used in such innovative ways that learners are engaged in higher-order thinking activities that are not possible without technology (Florida Center for Instructional Technology, 2020). The description of *TIM*'s final level corresponds to the description of the *Redefinition* level of the *SAMR* model by Puentedura (2006), since *Redefinition* occurs where unexpected, new tasks are created due to the presence of technologies.

Level 5: Conglomerate definition

Technology is used for new purposes, and lessons can in no way be done without these technologies. Learners are also highly involved and independent.

2.5 Frameworks and models that study technology integration into educational settings

Jahnke et al. (2017) refer to the use of four different frameworks used for studying the integration of technologies into educational settings. These include the *Substitution Augmentation Modification Redefinition* (SAMR) model (Puentedura, 2006), *Technological Pedagogical Content Knowledge* (TPACK) (Koehler, 2012) and the *Technology Integration Matrix* (TIM) (Florida Center for Instructional Technology, 2020). The fourth model, introduced by Jahnke et al. (2017), is *Digital Didactical Design* (*DDD*), a research framework used in studies of teachers' lesson designs for teaching and learning in tablet classrooms (Jahnke et al., 2017).

All four these frameworks and/or models have one key component in common: An instrument that provides guidance to the researcher for conducting research and/or improving practice using the constructs of the framework. All four of these instruments were developed by the original authors of the frameworks, adding vital authenticity and stature to the instruments. The different instruments are contained in Table 2-4

Table 2-4. Instruments for research frameworks/models

(Florida Center for Instructional Technology, 2020; Jahnke et al., 2017; Puentedura & Bebell, 2020; Schmidt, Baran, Thompson, Koehler, Mishra, & Shin, 2009)

Framework / Model	Instrument	Author(s)
SAMR	Observation Summary Document	Puentedura and Bebell (2020)
TPACK	Survey	Schmidt et al. (2009)
TIM	Matrix	Florida Center for Instructional Technology (2020)
DDD	*DDD* observation sheet	Jahnke et al. (2017)

2.5.1 *SAMR* model

The *SAMR* model illustrates levels of transformation through digital tool use. The model has four levels arranged in descending order (i.e. Redefinition, Modification, Augmentation, Substitution) (Puentedura, 2012).

The researcher identified a study by Jahnke et al. (2017) where the *DDD* observation sheet utilises the *SAMR* model to observe the extent of technology use in classrooms. The *SAMR*'s four levels are integrated into the descriptions of the observation sheet's 5-point Likert scale. The Department of Basic Education (2017) also utilises the *SAMR* model to assist teachers in their reflections on their use of digital tools.

In a 2020 conference, Puentedura and Bebell (2020) presented an *SAMR* observation toolkit. It is based on a year-long study involving 146 observations across all major subjects from grades 5 to 12. This observation sheet enables focus on the interactions among teachers and learners, the intended lesson purposes, the activities involved in classroom learning, as well as the technologies that assist with these activities. It also assesses the general efficacy of the observed lessons.

2.5.2 *TPACK* framework

The *TPACK* framework considers how content knowledge (CK), pedagogical knowledge (PK) and technological knowledge (TK) inter-relate with one another, while technology's impact on pedagogy and content knowledge (i.e. TPK, TCK) as well as pedagogical content knowledge (PCK) is taken into consideration for an ideal combination of all elements called TPACK (Mishra & Koehler, 2006).

TPACK is useful to structure developmental work that aims to incorporate pedagogy, content and technology into educational practices (Baran, Chuang, & Thompson, 2011). It enables teachers to determine their knowledge needs to succeed in technology integration in their classrooms (Welsh, 2019). *TPACK* was originally aimed at establishing the constructs of the framework, but second generation studies now use the *TPACK* framework to improve teachers' in-practice knowledge and skills of teaching with technology (Baran et al., 2011). For teachers reluctant to integrate technology, *TPACK* focuses on their content and pedagogical strengths instead (Welsh, 2019).

TPACK has a survey designed by Schmidt et al. (2009) that can be used for classroom practice improvement. Teachers engage in self-assessment of their TPACKs using a

5-point Likert scale. The survey is user-friendly and requires little theoretical background of the *TPACK* framework. The terms and statements used are also designed in everyday, easy-to-understand language.

2.5.3 TIM

The *TIM* assists with the evaluation, not the judging or rating, of technology integration into the classroom. It is built on the constructivist learning theory. The third edition of the matrix was released in 2019 (Florida Center for Instructional Technology, 2020). There are five characteristics of learning environments that promote meaningful learning, which include classrooms that are active, collaborative, constructive, authentic, and goal-directed. These characteristics are measured on five levels of technology integration including *entry, adoption, adaptation, infusion,* and *transformation* as identified by Sandholtz et al. (1997).

2.5.4 Overview of *DDD*

In the paper *Digital Didactical Designs as research framework: iPad integration in Nordic schools,* the authors Jahnke et al. (2017) label lesson designs for tablet classrooms as *Digital Didactical Design.* A *Digital Didactical Design* (*DDD*) needs to be constructively aligned, while combining teachers' pedagogy (didactical designs) with the technology at hand (i.e. tablets). *DDD* reconsiders not only the learning activities, but the entire pedagogy involved in the interplay of the following: Teaching goals, the activities for learners, the types of assessment and the roles that both teachers and learners fulfil as enabled by tablets with internet access (Jahnke et al., 2017). This means that all five elements of *DDD* are reconsidered and constructively aligned. The deep learning supported by the aligned elements of *DDD* includes opportunities for online communication where knowledge can be created and shared, reflection for learners and process-based assessment. Such a *DDD* enables teachers to no longer teach courses that rely predominantly on a teacher-centred approach. Instead, learners engage in activities with multiple, divergent answers and outcomes that enables them to visually showcase their learning, even beyond the classroom.

2.5.4.1 The use of DDD in the literature

The researcher conducted a Google Scholar search on *Harzing's Publish or Perish* to determine the amount and type of research conducted within the field of *DDD*.

Harzing's Publish or Perish is a research tool that assists researchers with citations and metrics of academic resources (Washington State University, 2020).

The breakdown of the 60 published articles related to *DDD* is provided in Figure 2-7. Eight articles were not written in English and 32 were published by one or more of the original authors (I. Jahnke, E. Mårell-Olsson and P. Bergström). From 2013 to 2015 the original authors mostly focused their research on the transformation of didactical designs to suit the needs of iPad classrooms. Other topics included learner-centred teaching, active learning, power and control in educational relationships alongside technologies, creativity using iPads and, more recently, research on wearable technologies and Virtual Reality. Studies were conducted in schools and in higher education institutions.

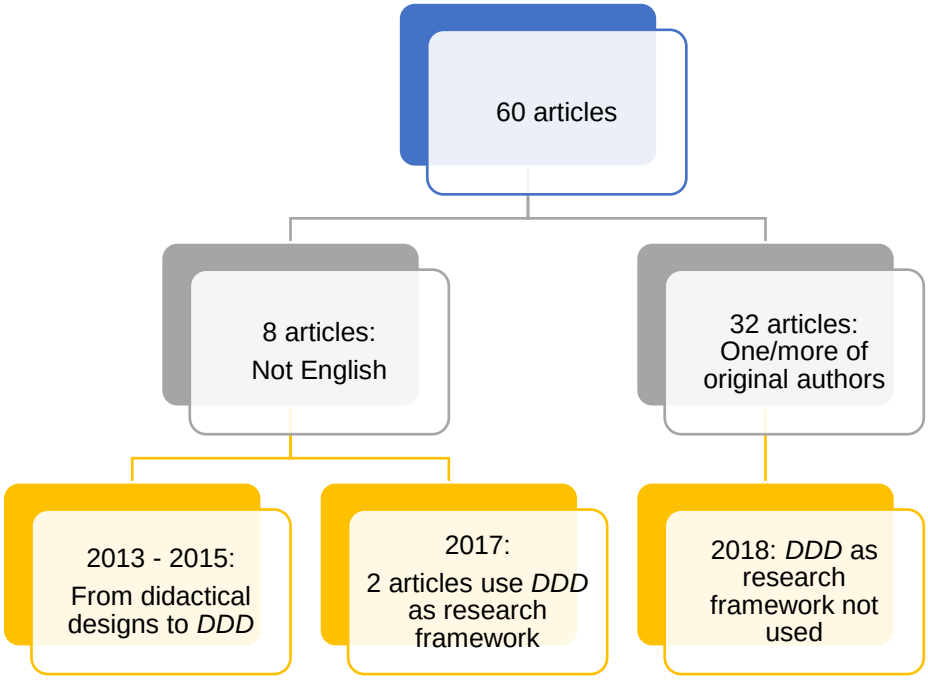


Figure 2-7. Published works on *Digital Didactical Design*

By 2017, *DDD* was established as research framework. From 2016 to 2020, few significant studies were conducted incorporating *DDD* as part of the research framework. *Harzing's Publish or Perish* identified the article *Developing primary teachers' TPACK through Digital Didactic Design (D3)* (Nilsson, 2018) and the researcher identified another titled *Digital Didactics: An introductory training course for teachers* by Perri (2018). Both these articles, however, focused on digital didactics without reference to *DDD* as research framework.

The two most relevant studies identified by *Harzing's Publish or Perish* were articles by Woloshyn, Bajovic, and Worden (2017) and Wiklund-Engblom (2018). Woloshyn et al. (2017) study the use of iPads for instructional purposes in a grade 1 classroom. Five classroom practice descriptions are included and analysed based on the five elements of the *DDD* framework. *DDD* successfully focuses on teaching objectives, various types of feedback, assessments, as well as social relationships. The *DDD* framework, therefore, provides a different perspective on the constructs of content, technology, and pedagogy of the *TPACK* framework.

Wiklund-Engblom (2018) studies nine Finnish upper secondary school teachers' perceptions of their digital didactical designs for their courses in distance education. The study focuses on the various social interactions as part of didactical designs and how teachers manage to identify and address the various needs of their learners in online learning environments.

2.5.5 Comparison of technology integration frameworks

Table 2-5 compares the key characteristics of the observation instruments of the four discussed technology integration frameworks. The *TPACK* and *SAMR* instruments enable users' determining of levels of technology integration, but fail to provide sufficient guidance on ways to improve the levels, confirmed by Welsh (2019) in terms of *TPACK*. The *TIM* and *DDD* instruments, on the other hand, include detailed level descriptors that provide users with suggestions to improve technology integration.

Table 2-5. Comparison of *TPACK*, *SAMR*, *TIM*, and *DDD*

(Florida Center for Instructional Technology, 2020; Jahnke et al., 2017; Puentedura & Bebell, 2020; Schmidt et al., 2009)

	TPACK	***SAMR***	***TIM***	***DDD***
Scoring system	5-point Likert scale	4- and 5-point Likert scale	Five levels of technology integration and learning environment characteristics.	5-point Likert scale
Descriptions of classroom practices	Three main constructs (Technology, Pedagogy and Content) and combinations of these.	**Open-ended:** Interactivity **Structured, scaled:** Lesson purposes, types of activities, behaviours, and traits.	Correspondence between the horizontal level of technology integration and the vertical level descriptors of classroom characteristics.	For every element of *DDD* there are clear descriptors of levels 1 – 5.
Types of data from the instrument	Quantitative and Qualitative	Quantitative and Qualitative	Qualitative	Quantitative and Qualitative
Summary of level of integration	Levels of domain knowledge can be determined based on the Likert scale scores.	The observation schedule does not provide detailed level descriptions, although all elements are observed in the schedule.	Each characteristic is studied individually, omitting a general impression (Florida Center for Instructional Technology, 2020).	Radar charts provide a visual overview of all aspects of tablet teaching.

2.6 TPD aimed at teaching with tablets

TPD should not be left behind (Pearson & Naylor, 2006) as it is a key determiner of tablet integration success (Buabeng-Andoh, 2012). Several authors refer to the value and importance of professional development for increased technology usage (Agyei & Voogt, 2011; Bernadine, 2019; Buabeng-Andoh, 2012; Daccord & Reich, 2015; Geldenhuys & Oosthuizen, 2015; Groff & Mouza, 2008; Kalogiannakis, 2010; MacDonald, 2009; Tondeur et al., 2016). Daccord and Reich (2015), however, are of the opinion that technology access is much easier than to affect real change through technology usage. Tablets that simply replace older technologies do not suffice (Daccord & Reich, 2015), since device implementation without proper TPD simply upholds the traditional teaching status quo (Montrieux et al., 2015). From international experience, South African schools that are mostly at the start of tablet implementation

can benefit from the value of high-quality, relevant TPD as seen from international experience.

2.6.1 Domains of TPD

TPD is seen as continuous training programmes aimed at improving teachers' knowledge, attitudes, and skills within learner education (Steyn & Van Niekerk, 2002) as well as effective classroom technology integration (Kalogiannakis, 2010). The domains of TPD are included in Figure 2-8.

Figure 2-8. Domains of TPD

(Steyn & Van Niekerk, 2002)

The knowledge domain of TPD programmes refers to innovative pedagogies (Dlamini & Mbatha, 2018; Geldenhuys & Oosthuizen, 2015; Pitsoe & Maila, 2012). The skills domain refers to teachers' improved computer skills (Buabeng-Andoh, 2012), gaining of necessary competencies, (Dlamini & Mbatha, 2018) and staying updated on technical and scientific developments (Gulston, 2010; Kastis, 2004). The attitudinal domain includes teachers' changed attitudes (Buabeng-Andoh, 2012) that translate into increased confidence (Dlamini & Mbatha, 2018), autonomy with digital tool use (Gulston, 2010; Kastis, 2004) as well as new visions for tools' application possibilities (Buabeng-Andoh, 2012; Pitsoe & Maila, 2012).

2.6.2 Requirements for effective TPD

Dlamini and Mbatha (2018) indicate that TPD must refrain from utopian scenarios and rather be contextually sensitive, considering and implementing teachers' personal experiences in the field. TPD programmes, therefore, need to be ongoing initiatives

(Bernadine, 2019; Dlamini & Mbatha, 2018) and presented subject-specifically. While being ongoing in nature, Daccord and Reich (2015) suggest implementing *Someday* and *Monday* plans. This acknowledges that teachers cannot redesign their curriculums for tablet integration in the middle of the year. *Monday* plans equip teachers with smaller ideas to experiment with during the next week, while *Someday* plans include long-term objectives.

TPD can and ought to respond to teachers' personal and professional needs (Kalogiannakis, 2010), while also being aimed at teachers' individual levels of expertise (Chen & Chang, 2006). TPD programmes that combine the expertise of experienced technology users with the less or inexperienced, often stimulate the sharing of trusted good practices and new insights from all parties involved (MacDonald, 2009). These insights can involve modelled use of technology (Department of Education, 2004) since examples and stimuli can improve teachers' innovative use of technologies in their classrooms (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Tondeur et al., 2016).

Ertmer and Ottenbreit-Leftwich (2013) state that during TPD, teachers' instructional methods need alteration to incorporate learner-centred, problem-focused lessons. The South African Department of Education (2004) recognises the ability of technology to enrich learning contexts. They envision TPD programmes that address both teachers' technical skills and their technological pedagogics as Kalogiannakis (2010) and Drenoyianni (2004) suggested.

2.6.3 International TPD programmes

As this study was designed as a TPD programme that was run at the target school, the researcher provides an overview of TPD programmes. Several international programmes from a variety of countries, including Greece, Flanders, Australia, Israel, Vietnam, Ghana, Kenya, and Sri Lanka, were explored. Table 2-6 contains the three programmes that contributed significant elements to this study's TPD design.

Table 2-6. International TPD programmes

Country	Policies and programmes	Description	Outcome
Australia (Tondeur et al., 2016)	TPD through social networking	• Teachers enhance their technology integration through participation in an online community. • Shift in TPD from content transfer to content creation	Teachers work collaboratively as well as analyse and reflect on their practices.
Country	**Policies and programmes**	**Description**	**Outcome**
Vietnam (Albion, Tondeur, Forkosh-Baruch, & Peeraer, 2015)	*Friendly Schools, Active Students*	• Based on TPACK and aimed at an evolution of pedagogics and curriculum • Reflective practices	• Clear relationship between research and practice • TPD communities provide support
Kenya (Tondeur et al., 2016)	Enhancing secondary schools' capacity for effective ICT-curriculum integration	Strategies included peer learning, lesson observations and reflections, sharing of good practice, and cyclical lesson improvement.	Aimed at combining technology provision with sufficient TPD.

2.6.4 South African TPD programmes

The need for TPD programmes that promote the integration of technologies into educational settings is expressed both globally and locally (Bernadine, 2019; Dlamini & Mbatha, 2018). In South Africa, a variety of policy documents aim to promote the provision of such TPD programmes. These policies and/or frameworks include *The White Paper on e-Education* (Department of Education, 2004), *Guidelines for Teacher Training and Professional Development* (Department of Education, 2007) and *The Professional Development Framework for Digital Learning* (Department of Basic Education, 2017).

The White Paper on e-Education (Department of Education, 2004) is the most comprehensive document stating the plans of the South African government and Department of Basic Education for digital learning. It sets out clear visions for well-equipped teachers that can drive digital education in South Africa. One such a vision includes, "Every teacher, manager and administrator in General and Further Education and Training must have the knowledge, skills and support they need to integrate ICTs in teaching and learning." (Department of Education, 2004, p. 25). This vision aligns well with suggestions from the literature to address teachers' knowledge, attitudes, and skills in TPD programmes (Kalogiannakis, 2010; Steyn & Van Niekerk, 2002). Furthermore, the document succeeds in acknowledging core principles of effective

integration of technologies into education aimed at teachers' learners. These core principles are summarised in Figure 2-9.

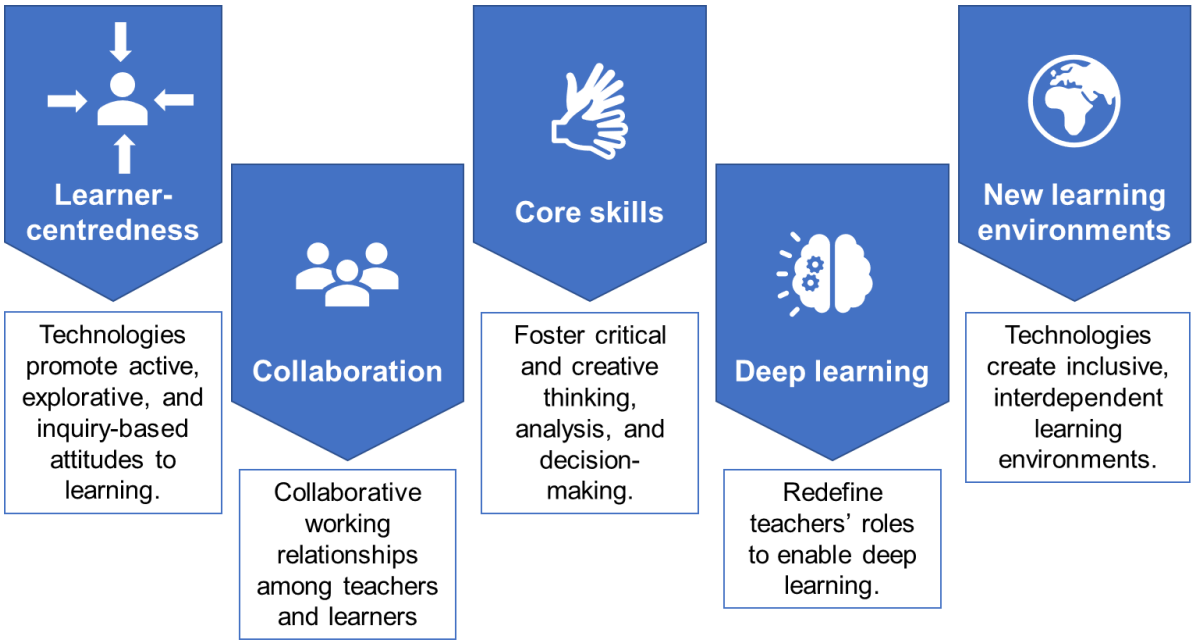


Figure 2-9. Principles of effective technology integration in education

(Department of Education, 2004)

The Department of Education has identified the need for a national framework containing teacher competencies for both pre-service and in-service teachers (Department of Education, 2004). The *Professional Development Framework for Digital Learning* was published in 2017 (Department of Basic Education, 2017). The framework has theoretical groundings in the *SAMR* and *TPACK* models. It provides 13 digital learning competencies with detailed descriptions of the knowledge, skills, and attitudes that teachers need to develop to reach the aims and objectives of the current education curriculum. On the one hand, these competencies point to a personal needs analysis of teachers. On the other hand, the competency guidelines can assist with planning processes aimed at TPD programmes for digital learning (Department of Basic Education, 2017). The list of competencies is included in Figure 1-2.

This framework document provides valuable recommendations for characteristics of TPD programmes, contextualised for the South African landscape. These characteristics are included in Table 2-7 (Department of Basic Education, 2017).

Table 2-7. Recommended characteristics of South African TPD programmes

(Department of Basic Education, 2017)

Characteristic	Description
Course content	Based on teachers' lived teaching and learning realities, not researchers' opinions
Building knowledge and skills	Teachers learn content by applying it (i.e. learning by doing).
Collaboration and sharing	Enhanced practice through sharing of personal, peer and/or international experiences
Principles of adult learning	Learning is situated within teachers' circumstances to suit their needs and fields of interest.
Situational learning	Learning occurs in context that are socially, technically, and geographically relevant.
Reflection	Teachers reflect on their applications, while evaluating and challenging their practices.
Peer-coaching	As teachers explore how technologies can be used, they support each other in a non-hierarchical, collaborative fashion.
Sustainability	The programme's impact lasts longer than the programme's duration.

2.7 Community of Practice (CoP)

2.7.1 The benefits of a CoP

People, in our case teachers, who share a common passion and engage in regular interactions with each other, function as a CoP (Wenger, 2011). A CoP is a platform for teachers to share their common interests, discuss their challenges or raise their concerns (Serrat, 2010) as well as brainstorm, experiment with and assess solutions aimed at improving their teaching practices (Albion et al., 2015; MacDonald, 2009). As teachers share their experiences, they realise that they are not alone in the barriers they encounter (ChanLin, 2017).

Figure 2-10 depicts the many benefits associated with the establishment and maintaining of a CoP. Additionally, CoPs are also good platforms to assess the quality of TPD programmes (Dlamini & Mbatha, 2018).

In contrast to all the benefits, Geldenhuys and Oosthuizen (2015) highlight that not all teachers are equally willing to participate in collaborative actions. Possible causes include the time required for such collaborative efforts, teachers' unwillingness to share their ideas and practices, teachers' feelings of insecurity about their practices, or poor guidance on how collaboration efforts ought to function properly.

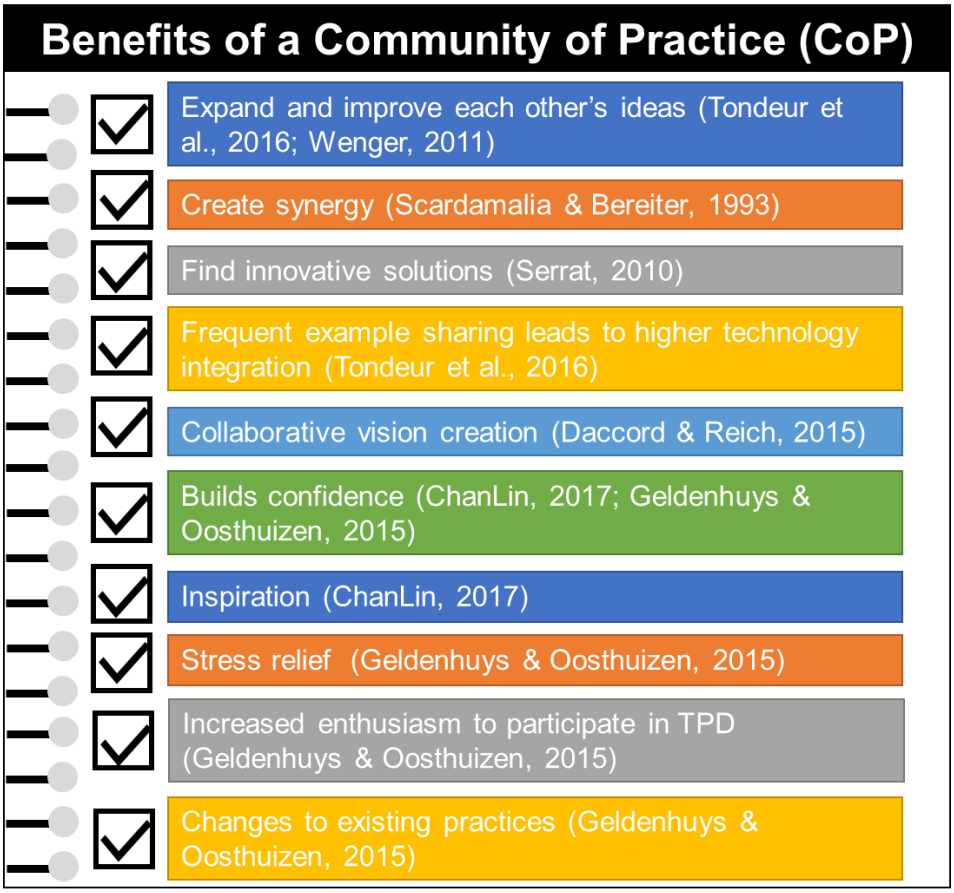


Figure 2-10. The benefits of a CoP

(ChanLin, 2017; Daccord & Reich, 2015; Geldenhuys & Oosthuizen, 2015; Scardamalia & Bereiter, 1993; Serrat, 2010; Tondeur et al., 2016; Wenger, 2011)

2.7.2 Prerequisites for establishing a CoP

MacDonald (2009) emphasises three prerequisites for successful CoPs as illustrated in Figure 2-11.

Firstly, membership is based on personal motivation and not compulsory attendance. Secondly, members form strong interpersonal relationships, characterised by trust and comfort around each other. Thirdly, the researcher as CoP member contributes suggestions and support based on sound theoretical principles (Niesz, 2007).

This study aims to explore teachers' digital didactical designs and levels of technology integration. The study will be supported by a TPD and CoP. The use of *DDD* in combination with TPD and CoP has neither been documented in an international nor in the South African context before.

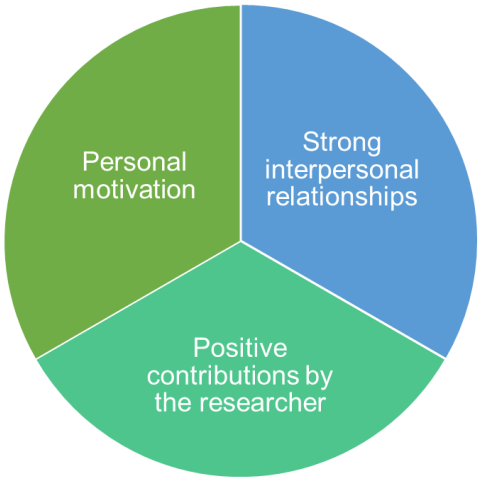


Figure 2-11. Prerequisites for successful CoPs

(MacDonald, 2009)

2.8 Conceptual framework of this study

The conceptual framework of this study is based on several authors' work (Anderson & Krathwohl, 2001; Department of Education, 2007; Jahnke et al., 2013, 2014a) and contained in Figure 2-12. The *DDD framework* in the centre is the main element. Branching from *DDD*, surface and deep learning and the *SAMR* levels are explicitly observed and evaluated when using the *DDD* observation sheet for teachers' designs. In the second pyramid, teachers' ICT proficiency levels are explored, since this study provides a TPD and aims to speak to the South African *Teacher Development Framework* (Department of Education, 2007) of Figure 2-5. This framework links in well with the *SAMR* levels, and is explored in the earlier parts of the literature review.

The conceptual framework remained open for modification for the duration of the study to enable addressing of data arising from the research context. This aligns with qualitative studies' data that is emerging and not merely predicted or measured (Rossman & Rallis, 2017).

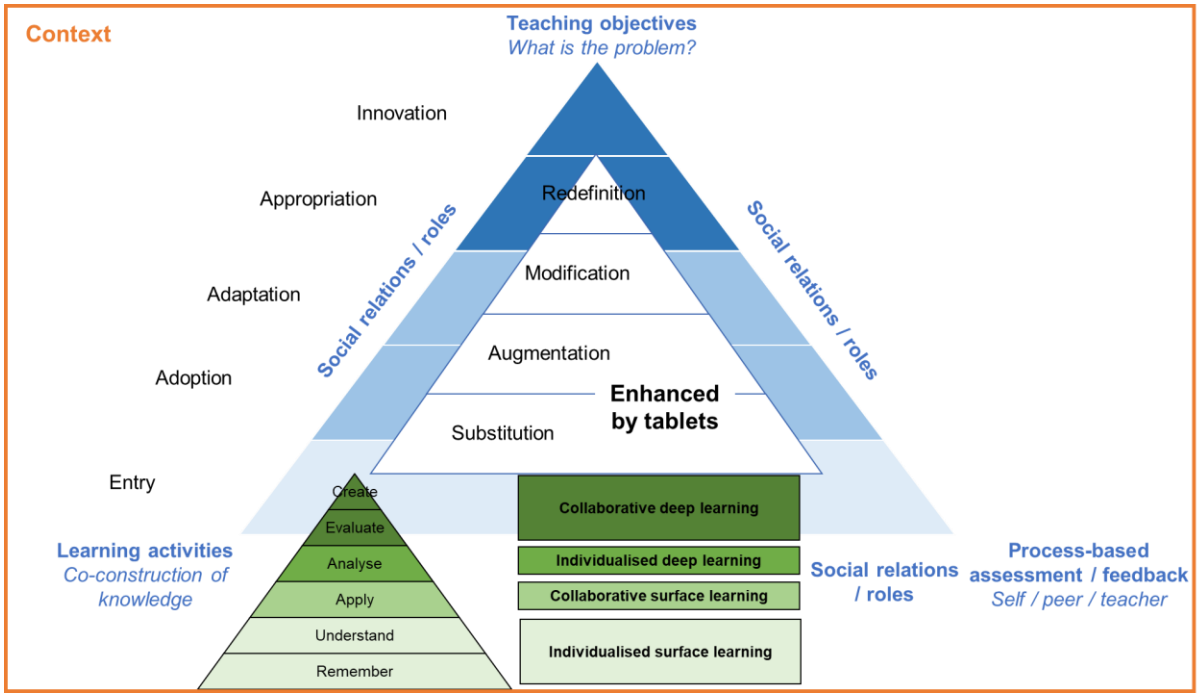


Figure 2-12. Double-pyramid of the *Digital Didactical Design* conceptual framework

(Anderson & Krathwohl, 2001; Department of Education, 2007; Jahnke et al., 2013, 2014a)

The various theoretical frameworks used for the study's conceptual framework are discussed.

2.8.1 *DDD* framework

DDD enables the integrated design of teaching and learning activities while using technologies (Jahnke et al., 2017). Teachers' planning for learning and teaching involves the design of learning activities that enable the attainment of planned teaching objectives in order to make learning happen (Jahnke et al., 2014b). Both teaching and learning are redefined in *DDD*: Teachers' designs are focused on activities, while learners produce knowledge continuously instead of being mere passive knowledge receivers (Jahnke et al., 2014b). Lund and Hauge (2011), in their development of designs for technology-rich classrooms, support *DDD*'s notion that planning needs to be done for both teaching and learning activities.

DDD consists of five aligned elements that need to be included in the educational design (Jahnke et al., 2013). Each of the five elements needs to be designed in such a way as to improve both teaching and learning processes (Jahnke et al., 2017). *DDD*

underwent several iterations, but the version used in 2013, included in Figure 2-13, is very descriptive (Jahnke et al., 2013).

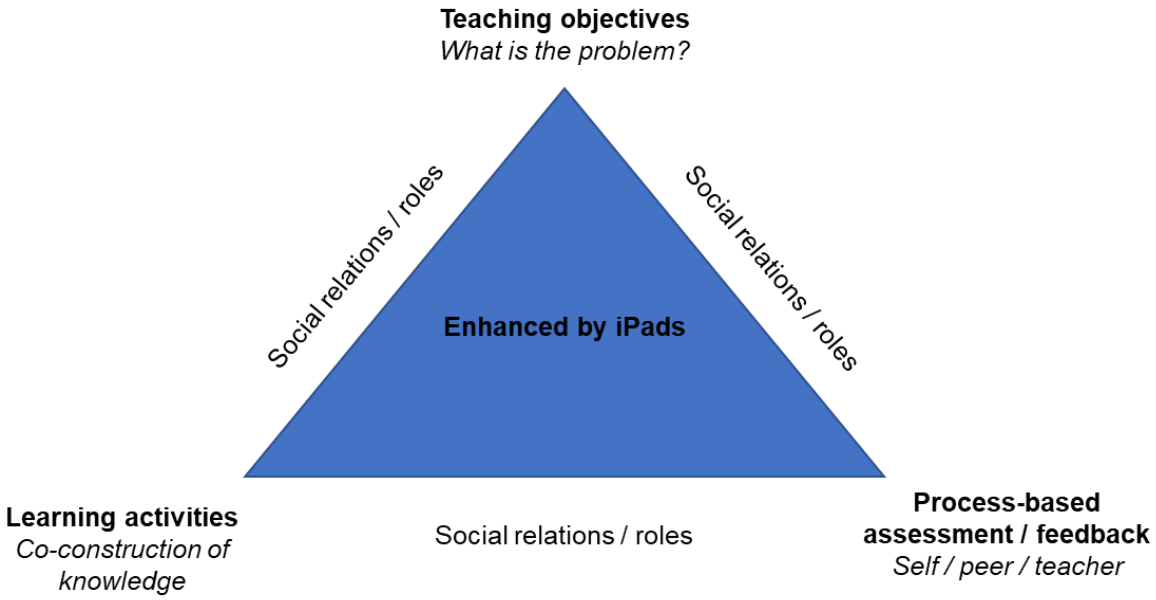


Figure 2-13. Early version of *Digital Didactical Design*

(Jahnke et al., 2013)

In some of the earlier work on *DDD* by Jahnke et al. (2013), the authors state that teachers need to specifically design for the five elements of a didactical design. This includes designing the *teaching objectives* (top of the triangle), *learning activities* (bottom left corner), *process-based* feedback by assessment agents like the self, peers and teachers to improve both individual and group learning (bottom right corner), interactions to stimulate social relations (all sides of the triangle), and design to incorporate mobile devices (i.e. tablets) and apps into learning activities (centre of the triangle).

DDD is a well-suited framework for this study's TPD opportunity, since its envisioned lesson designs for tablet classrooms that allow teachers' planning to address the principles of effective technology integration, presented in Figure 2-9. The corresponding principles and elements of *DDD* are provided in Table 2-8. The discussed correspondence is based on the contents of the principles of effective technology integration (Department of Education, 2004) and the *DDD* observation sheet (Jahnke et al., 2017).

Table 2-8. Principles of effective technology integration and *DDD*

Principles of effective technology integration	***DDD***
Learner-centredness	LA
Collaboration	All *DDD* elements, specifically LA and RO
Core skills	TG/ILOs, LA, and ASM
Deep learning	LA and RO
New learning environments	TAB

Learner-centredness is achieved through the types of learning activities included in *DDD*. Such activities allow learners to transform from inactive knowledge receivers to active knowledge creators, in collaboration with their peers.

Collaboration, seen as a teacher-learner partnership, is achieved in various ways using *DDD*. In terms of teaching objectives, the most ideal objectives described on the *DDD* observation sheet are those composed by teachers and learners. Collaboration is also encouraged through the types of learning activities of *DDD* that promote peer interaction. Collaboration is such an integral part of DDD, that one of its five core elements is social relations. *DDD*'s interactions are envisioned to appoint teachers and learners in various roles where natural collaboration and knowledge sharing can occur. The collaborative efforts visible in feedback and assessment, provided by the self, peers, and the teacher, automatically imply a great deal of collaboration. The use of technologies (i.e. tablets), owing to the intention of *DDD*, needs to enable and stimulate quality interactions among class members, the teacher and collaborators beyond the classroom.

The *core skills* include the 21st century skills of communication, collaboration, critical thinking, and creativity (Cooper, 2016). *Collaboration* is seen as a separate principle, but is widely included in the four skills as well. *Communication* is vital, therefore the teaching objectives are communicated electronically to learners. As learners engage in the learning activities, they encounter authentic problems that require them to employ all four these skills (i.e. 4Cs) as well as *analysis*, the other core skill. The continuous feedback provided by the self (through reflection), peers, and the teacher, establish clear pathways of *communication*, while *collaboration* and *critical thinking* are included as well. By adopting different roles and acting within various social relations, learners also develop their core skills.

Deep learning, another principle, is once again greatly emphasised in *DDD*. It is one of the five core elements observed on the *DDD* observation sheet, made explicit in the learning activities. The authors of *DDD* envision deep learning as collaborative, higher-order thinking encounters. Teachers engage learners in shaping their own learning experiences, moving away from classes founded on the principles of teacher-centred direct instruction. Instead, learners are active and mobilised to produce materials, rather than only memorise facts. The principle of deep learning that requires a reconsideration of teachers' roles is evident throughout *DDD*, especially seen in the social/multiple roles.

New learning environments, the last principle, lies at the heart of *DDD* and at the core of its model. According to the fifth element of the *DDD* observation sheet, technologies allow learning to become multimodal and interactive, extending beyond the limits of the classroom for both information and communication purposes.

2.8.2 In-depth explanations of the terms Digital, Didactical, and Design

The terms digital, didactical and design used in *DDD* are rich in meaning, whether used as single terms, or in combination of terms. A summary of the overarching meanings and uses of the terms is provided in Figure 2-14 (Hudson, 2011; Jahnke et al., 2017; Jahnke et al., 2014a; Kansanen & Meri, 1999).

DDD provides a specific lens for classroom observations. In several studies (Jahnke et al., 2017; Jahnke & Kumar, 2014; Jahnke et al., 2013, 2014a; Jahnke et al., 2014b), the original author, Isa Jahnke, explored the effect of technologies (i.e. the **digital** element) on teachers' didactical designs in tablets classrooms using *DDD* as framework.

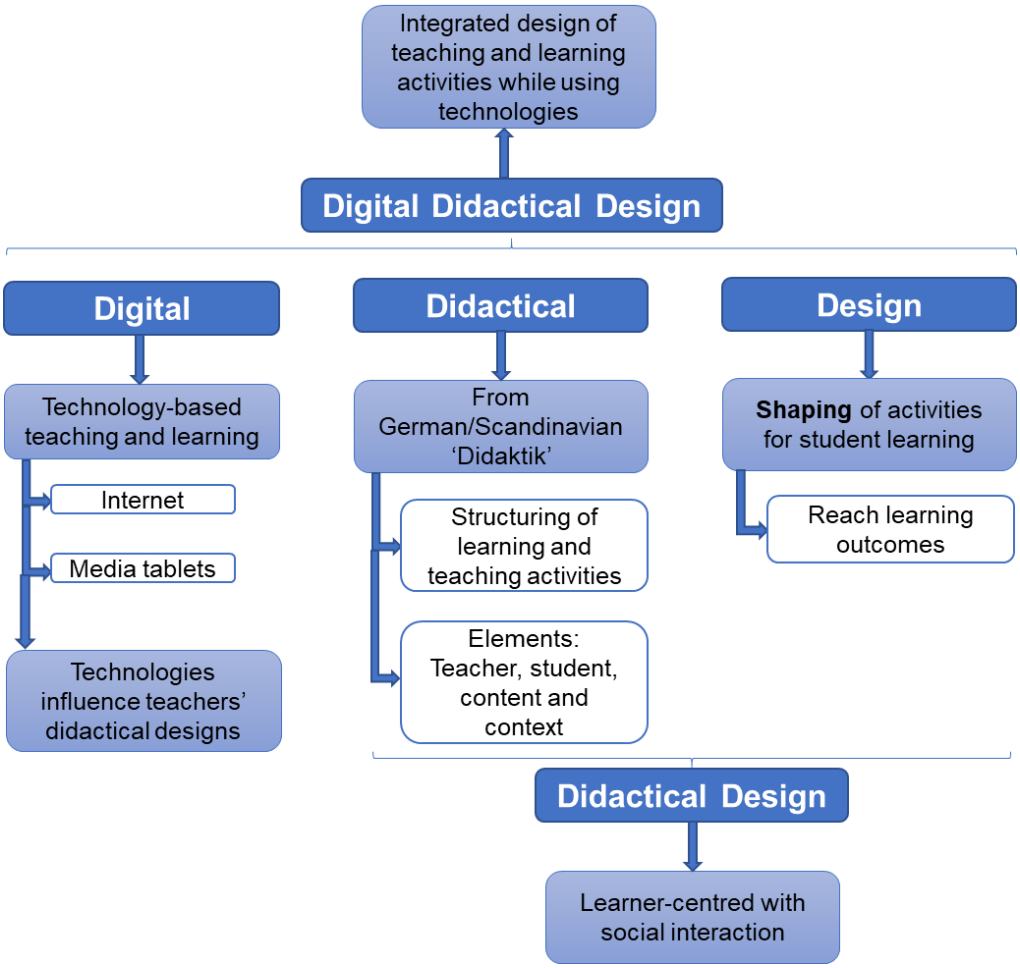


Figure 2-14. Digital, Didactical, and Design in *DDD* explained

(Hudson, 2011; Jahnke et al., 2017; Jahnke et al., 2014a; Kansanen & Meri, 1999)

Didactics encompass various aspects of teaching and learning (Jahnke et al., 2017; Jahnke et al., 2014a) contained in Figure 2-15. Furthermore, didactics consist of three key elements represented by the didactic triangle in Figure 2-16 (Kansanen & Meri, 1999). The didactic triangle illustrates the involvement of two persons (i.e. teacher and student) where one needs to learn something (i.e. content) during the interaction (Pramling, Wallerstedt, Lagerlöf, Björklund, Kultti, Palmér, Magnusson, Thulin, Jonsson, & Samuelsson, 2019), however, interactions among all three elements can occur (Hudson, 2007).

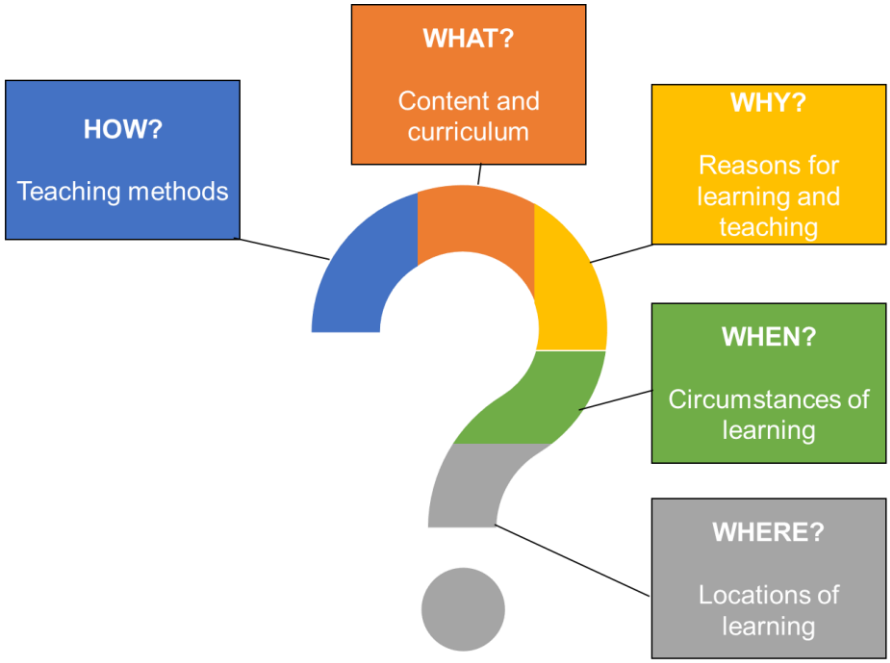


Figure 2-15. Aspects of didactics

(Jahnke et al., 2017; Jahnke et al., 2014a)

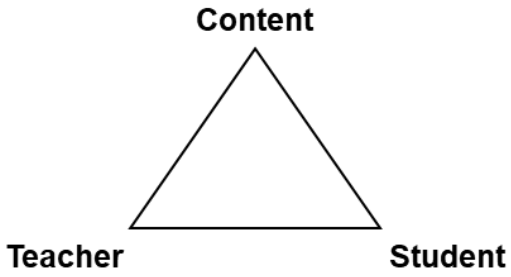


Figure 2-16. The didactic triangle

(Kansanen & Meri, 1999)

Didactical Design is based on the work of Wolfgang Klafki's *Didaktik*, Hudson's *Didactical Design for Technology Enhanced Learning* as well as the work of Fink and Lund & Hauge (Jahnke et al., 2013). Didactical design prioritises learner-centred approaches (Jahnke et al., 2014a) that activate student learning (Jahnke et al., 2014b). Tablet teaching and learning ought to become as personalised as the devices at our disposal. This means that didactical designs include content, learning methods, and a consideration of how and why technology is included (Hudson, 2011).

Furthermore, these devices ought to build social relations (Jahnke et al., 2014a) and interactions (Hudson, 2008).

Teaching has become a **design** profession like engineering, as teachers shape learning activities around the prescriptions (i.e. curriculum) (Hudson, 2011). As teachers design, they construct a picture of what they have in mind, while considering all aspects of an activity (Hudson, 2011). Teachers' entire design processes for teaching and learning are aimed at outcome attainment (Jahnke et al., 2017).

2.8.2.1 Teaching objectives vs content

The didactic element of curriculum content (Kansanen & Meri, 1999) is included as *teaching objectives* in *DDD.* Content is, therefore, not used as a separate element in *DDD.* Considering that content is one of the key elements of the didactic triangle, the lack of explicit reference to content in *DDD* might seem like a weakness. However, included in *teaching objectives*, according to Kansanen and Meri (1999), is the entire teaching-studying-learning process that aims to reach these teaching objectives. These objectives, visible as the consequences of learning, encompass didactics as well as a student-content relationship. Pramling et al. (2019) support the notion of either *content* or *learning outcomes* as advocated by Jahnke et al. (2013) and Kansanen and Meri (1999), since the consideration of the *what* of learning (i.e. its content) can be referred to as "object of learning" (Pramling et al., 2019, p. 24), although *content* is preferred. Evidently, the *aims* or *objectives* of *content* and *teaching* can be used interchangeably, signifying the things learners need to study.

2.8.3 Surface and deep learning

For many years, teachers were textbook-driven conveyors of learning content (Kember, 1997), and learners merely consumers and reproducers of information (Jahnke et al., 2017). This practice is considered surface learning and very typical of teacher-centred classrooms (Jahnke et al., 2014a).

Marton and Säljö (1976) practically explained the concepts of surface and deep learning: Learners either read a text for overall comprehension (called *deep learning*), or they remember small textual details for tests and scoring good grades (called *surface learning)* or apply a combination of these reading strategies.

In later work, Kember (1997) used a continuum description to illustrate how surface learning progresses towards deep learning as teachers facilitate learners' conceptual

understanding. The alternative to teacher-centred surface learning, therefore, is learner-centred deep learning (Jahnke et al., 2017). A simplified continuum is included in Figure 2-17.

Figure 2-17. Surface to deep learning continuum

When deep learning occurs, learners' roles change to that of learning content producers instead of consumers (Jahnke et al., 2017). When implementing *DDD*, tablets need to enable deep, meaningful learning (Jahnke et al., 2017). Deep learning encounters include authentic learning tasks, as well as active and collaborative learning (Howland, Jonassen, & Marra, 2012). It also includes evaluation done by learners, as well as the creation and sharing of multiple perspectives (Jahnke et al., 2014a). Tasks ought to elicit higher-order thinking from learners, including application, creation and problem solving, while internet resources, videos, and online communities support their learning (Jahnke et al., 2014a). The matrix of surface and deep learning in Figure 2-18 ranges from individualised surface learning to collaborative deep learning (Jahnke et al., 2014a).

Individualised surface learning Teacher-centred approaches Learner as consumer Read from textbook Remember and understand	**Collaborative surface learning** Learning in groups Tasks divided among students Application
Individualised deep learning Multimodality Critical thinking Analysis	**Collaborative deep learning** Learner-centred approaches Peer-reflective learning Learner as producer Evaluate and create

Figure 2-18. A matrix for individualised surface to collaborative deep learning

(Jahnke et al., 2014a)

Based on the matrix of Figure 2-18, the researcher designed a visual representation of increasing cognitive levels in Figure 2-19. This representation indicates the progression from individualised surface to collaborative deep learning while

incorporating the cognitive levels of Bloom's taxonomy. It is based on the work by Jahnke et al. (2014a).

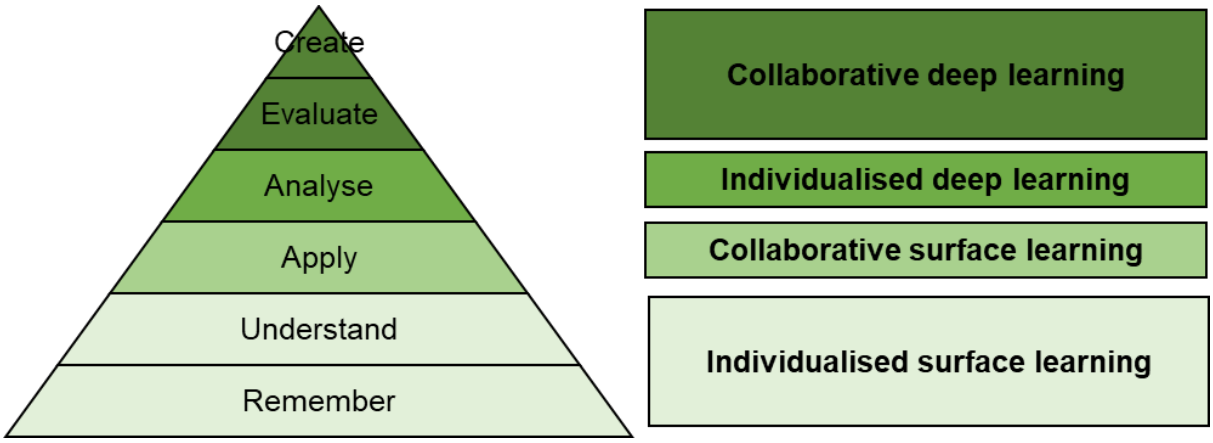


Figure 2-19. Surface and deep learning and Bloom's Taxonomy

Adapted from Jahnke et al. (2014a)

2.8.4 *SAMR* model

The *SAMR* model's use in the conceptual framework entails an assessment of the level of tablet integration present in the lesson. This aligns well with the original use of the model (Puentedura, 2006). When using the *SAMR*, the higher the level of teachers' designs (i.e. progressing from *Substitution* to *Redefinition*), the more learner-centred and socially interactive the classroom becomes (Jahnke et al., 2017).

2.8.5 Context

Classroom instruction is done against the backdrop of a teacher's preferred instruction methods (pedagogy), as well as the social setting that provides focused context for the teaching and learning (Hudson & Meyer, 2011). This necessitates the consideration of the context of *DDD.* The proposed elements of *DDD* are situated in a specific context created by teachers' lesson designs, the use of the tablets, and the design of the study's TPD opportunity. This context is illustrated by an orange rectangle that includes both the pyramids of teaching and learning.

2.9 Gaps in the literature

Based on the researcher's exploration of the use of *DDD* employed as research framework, various gaps in the literature were identified. Firstly, the *DDD* research framework has not been used for research on South African teachers' designs for

tablet classrooms. Secondly, no studies focusing on either language teachers or Afrikaans and English language teachers' digital didactical designs have been conducted to date (cf. Heading 1.3). Thirdly, the possibility for teachers (and not only researchers) to use the observation sheet to determine their own digital didactical designs has not been explored yet, as can be done with other frameworks' instruments like *TPACK* and *TIM*. The researcher assumes that teachers using the *DDD* observation sheet to design lessons for their tablet classrooms will benefit from constructively-aligned plans for learner-centred teaching and learning. Furthermore, the researcher assumes that participants can benefit from both a TPD and a CoP among language teachers through collaborative, cyclical planning.

2.10 Conclusion

This literature study presented a balanced view of the advantages and challenges of learning and teaching with tablets as experienced by both teachers and learners. It progressed into a discussion of tablet teaching that either replicates or transforms existing educational practices. Owing to the differences in tablet utilisation across classrooms, an exploration of the levels of technology integration provided insight on the views to integration. The need to address teachers' tablet teaching practices informed an exploration of published instruments associated with some theoretical frameworks. The comparison between the instruments gave an overview of the typical elements observed in teaching with technology in general. Associated with the instruments, the literature study explored examples and elements of international and local TPD programmes along with the value of CoPs. In conclusion, this literature study succeeded in combining tablet teaching, designs for tablet classrooms, and TPD opportunities to develop teachers' digital didactical designs in the conceptual framework.

CHAPTER 3. METHODOLOGY

3.1 Introduction

The researcher had to consider her stance on what constituted truth and knowledge, how truth and knowledge could be known, and by means of which methods this knowledge building could be done (Waring, 2017). The methodological orientation functioned as platform for the researcher to express her position and interaction with participants during the research (Mills, 2017). The methodology enabled the researcher to reach the intended aims and purposes of the study (Mills, 2017). This necessitated a discussion of the researcher's assumptions, expressed in the study 's ontological, epistemological, and methodological stances as well as the research methods used. These stances were embedded in an overarching philosophical orientation. Sefotho and Haupt Du Plessis (2018) provide a visual model in Figure 3-1 that indicates how the philosophy influences the entire methodology of a study.

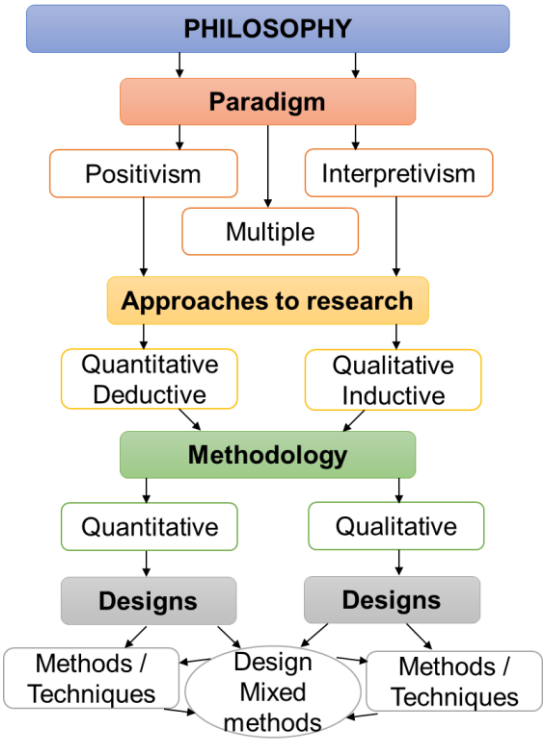


Figure 3-1. From philosophy to methodology

(Sefotho & Haupt Du Plessis, 2018)

Based on the model of philosophy to methodology, this study's methodology is visually depicted in Figure 3-2. Each of these methodological elements is discussed in detail.

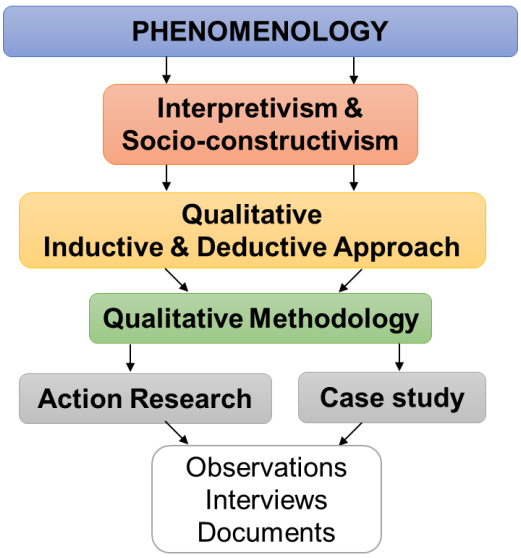


Figure 3-2. The study's methodology

3.2 Philosophy

Phenomenology is a popular qualitative research design for studies in education, first used for educational research by Maxine Greene according to Adams and Van Manen (2012) and Max van Manen (Van Manen, 1984). As humans live through a multitude of experiences, every individual interacts differently with these experiences (Nieuwenhuis, 2016c). Yet, the commonalities among these experiences and our reflections on these provide the material for phenomenologists (Adams & Van Manen, 2012).

The phenomenon explored in this study was the experiences of four English and Afrikaans language teachers who designed lessons for their tablet classrooms using MS Teams and *DDD*. The study explored how the phenomenon of their designs was shaped by interactions with CoP members, as well as the influence of the study's TPD opportunity. The *what* and the *how* of the participants' experiences were valued (Nieuwenhuis, 2016c). Phenomenological studies describe and interpret phenomena as the lived experiences of a group of people (Adams & Van Manen, 2012; Nieuwenhuis, 2016c).

Hermeunetic phenomenology was employed as sub-category in this study. Participants acted in accordance with the suggestions of Adams and Van Manen

(2012). This included reflection on their experiences through language and writing, as well as lesson observations and reflective discussions among the CoP members. As the participants reflected, they also thought about their experiences and highlighted emergent themes. As themes were identified, the correlation among participants' experiences were highlighted and this accentuated the mutual experiences that describe the phenomenon under study (Nieuwenhuis, 2016c).

3.3 Ontology

The paradigm of research as first used by Kuhn (1970), refers to shared notions of a community pertaining to its values, beliefs, generalisations as well as its agreement on knowledge's nature and reality. According to Lincoln, Lynham, and Guba (2011), these are determined by a specific worldview. While there are as many paradigms as worldviews, each is distinct in its axiology, ontology, epistemology, and methodology (Kaushik & Walsh, 2019). Waring (2017) illustrates four questions of the researcher's theoretical position (i.e. the paradigm) as represented in Figure 3-3.

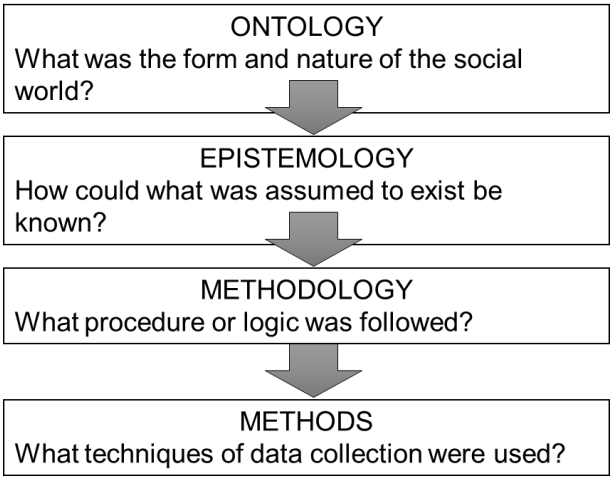


Figure 3-3. Theoretical position questions

(Waring, 2017)

This study's ontological stance, the declaration of what form and nature knowledge assumed, was interpretivism. It is a popular paradigm for educational research (Bryan, Carpenter, & Hoult, 2010). For interpretivists, reality is meaning constructed by individuals' interpretations of subjective experiences (Jansen, 2016; Sefotho & Haupt Du Plessis, 2018), or it can be truth as constructed by communities (Jansen, 2016). Such socially-determined realities disregard the notion of positivism's singular reality (Gray, 2009) to accommodate the wide spectrum of personal interpretations of events

(Nieuwenhuis, 2016b), therefore multiple realities (Waring, 2017). Just as the intersubjective meaning created in interpretivist studies is a vital element of comprehension (Jansen, 2016), the ontology and epistemology of phenomenology value the same.

Interpretivism acknowledges and values the relationship among the researcher and participants (Sefotho & Haupt Du Plessis, 2018). Since this relationship is a key ingredient of interpretive research, no distinction is made between the researcher and participants (Jansen, 2016). The researcher gained an in-depth understanding of participants' individual and collective interpretations of experiences. This study's CoP and TPD opportunity allowed teacher participants to share in their experiences with the researcher. They set goals, crafted lesson designs, and reflected on their teaching practices, while receiving CoP inputs on their lesson designs and conceptualisations. The researcher maintained a comfortable, friendly, yet professional relationship with the participants.

One of the key strengths of qualitative, interpretive studies is the detailed data gathering and thick descriptive elements (Nieuwenhuis, 2016b). Cohen, Manion, and Morrison (2007) emphasise the importance of the researcher's role to provide not only descriptions, but also explanations of reality (Nieuwenhuis, 2016b). The researcher had to guard against subjectively interpreted meanings based on her own personal knowledge foundation, exposure, and experiences (Nieuwenhuis, 2016b). She managed to truthfully represent participants' realities and experiences by maintaining the quality criteria, and by frequently exploring participants' own interpretations.

3.4 Epistemology

Kivinja and Huyini (2017) describe epistemology as ways of knowing what the truth is. To answer the second question of Waring (2017) in Figure 3-3, this study employed socio-constructivism as the epistemological stance. Socio-constructivism is well-aligned to interpretivism (i.e. this study's ontology) and its socially-constructed meanings, just as phenomenology values lived human experiences (Adams & Van Manen, 2012).

Constructivism involves qualitative, textual data and efforts to represent participants' subjective and multiple worldviews or realities (Creswell & Plano Clark, 2018; Waring, 2017). It does not offer fixed theories, predictability or cause and effect. Instead, reality

is that which is created in participants' minds (Howell, 2015). This study was therefore, oriented towards constructivism. The axiology (i.e. the central value) of the study's philosophy and paradigm was subjectivity (Howell, 2015).

Constructivism refers to people's meaning-making through active interpretations of the world (Howell, 2015). This is closely related to interpretivism, where meaning is interpreted by individuals and does not simply exist. Such meaning-making occurred in both the participants and the researcher as they contributed their shared experiences (Howell, 2015). Constructivism is criticised that it could accept everything as true as people create their own realities. This criticism is counteracted through ongoing researcher and participant interaction and consensus on shared meanings (Howell, 2015).

Moving from constructivism, socio-constructivism values individuals' meaning-making while interacting with their communities (Howell, 2015). In fact, the meanings of the individual and the community can barely be separated (Howell, 2015). While engaged in action research, this study's participants as CoP members contributed to each other's views, knowledge, and teaching practices. These contributions were visible in online interviews, discussions, planning, and informal social interaction among the participants at the school or after hours.

3.5 Approach

This study employed a combination of mainly inductive, but also deductive reasoning as part of the qualitative methodology. Inductive research has an exploratory nature with a keen interest in situated human actions while experiencing some issue (Hammersley, 2019). Inductive reasoning is just as subjective as phenomenology, interpretivism, and qualitative studies (Sefotho & Haupt Du Plessis, 2018). Case studies benefit from the inductive approach, since the rich, thick data generated through the research opens new ideas (McLaren, 2012).

The inductive approach influenced the data gathering, analysis, and interpretation processes, as expressed by McLaren (2012). Inductive coding was done where the researcher searched for emerging patterns in the data (McLaren, 2012). These identified patterns could contribute to theory (Nieuwenhuis, 2016b) as code categories were determined by the data (Elo & Kyngäs, 2008). Some prediction of expected

behavioural patterns emerged mostly from the data, not prior theory (Hammersley, 2019; Sefotho & Haupt Du Plessis, 2018).

The prior theory of *DDD* did, however, influence the theory building as well. For this reason, deductive reasoning was also employed where pre-existing elements of *DDD* were identified in the data by the researcher. This aligned with the definition of deductive reasoning by O'Leary (2011) who states that the deductive approach moves from a theory that can be applied to specific examples.

Despite inductive case studies' pattern identification, not all identified patterns are relevant, therefore focus needs to be maintained (McLaren, 2012). The most prevalent patterns became clear while the researcher collected and analysed data simultaneously and recursively, as suggested by McLaren (2012). Even so, these patterned findings were context-embedded, and other cases could contradict the patterns of the case at hand (Fox, 2012).

While this study's focus was influenced by the existing model and observation sheet of *DDD,* the researcher ensured that participants had ample opportunity to share their own experiences. By sharing their own experiences, the participants provided insights into their personal teaching practices, technical realities, and digital didactical designs.

3.6 Methodological stance

The third question, that of the study's methodological stance, considers the pattern of logic used to understand the knowledge (Waring, 2017). The researcher chose the qualitative methodology from the methodological choices in Figure 3-1. The qualitative approach is for research in natural settings (Creswell & Poth, 2018; Hurworth, 2011; Nieuwenhuis, 2016b; Rossman & Rallis, 2017) and is well-aligned to interpretivism (Bryan et al., 2010; Denzin & Lincoln, 1994; Hurworth, 2011). Qualitative research aims to represent the natural events of the world, referred to as phenomena and how people make meaning of these (Van Maanen, 1979). It advocates inquiry by means of words and observations to create a multifaceted, full grasp of a phenomenon (Creswell & Poth, 2018).

In this study, the data used were participants' words from their personal experiences, as Nieuwenhuis (2016b) suggested. The interaction among the researcher and participants gathered detailed data that were loaded with subjectivity, a notion expressed by Rahman (2017) as well. The influence of the researcher on the research

process cannot be overlooked (Bryan et al., 2010). Qualitative researchers are just as much constructing meaning through their senses as through the data gathered from their participants' experiences. These researchers are central to the research process, especially in decision making and the framing of questions (Rossman & Rallis, 2017). In fact, the researcher was an instrument used for data gathering as described by Creswell and Poth (2018). While some interview questions and observation guidelines were designed beforehand, the researcher and participants reacted to the information shared during the interviews. Additional questions, aligned to the conceptual framework, were also designed as the study progressed and conceptualisations deepened.

One of the key strengths of qualitative research is the rich, detailed data that it gathers (Rossman & Rallis, 2017). This creates a complete picture of human experience (Rahman, 2017). Data is gathered through multiple methods aimed at decision-making, the attempt to improve circumstances ,and possible contributions to theory (Rossman & Rallis, 2017).

Qualitative research is criticised for its inability to formulate generalisations (Hammersley, 2008). It is due to the study's context-embeddedness, i.e. being situated within temporal and spatial limits, that the research findings cannot be generalised (Bryan et al., 2010). The lack of generalisability is countered, however, by in-depth descriptions and meaning-making (Bryan et al., 2010). According to Thomson (2011), it is the small samples of qualitative studies that limit their ability to generalise their findings. Mills (2017) contributes to the list of critique by stating that some researchers are of the opinion that qualitative research lacks quality criteria. In contrast, substantial thought on ensuring quality in qualitative research, as found in the literature, was adhered to in this study. Another critique refers to the possibility that small-scale studies have less of an impact on the body of literature available, than large-scale longitudinal studies (Mills, 2017). Contributing to the issue of impact, Rahman (2017) indicates that policy-makers tend to prefer quantitative data for decision-making purposes, thereby often disregarding the findings and recommendations of qualitative studies.

As Rossman and Rallis (2017) stated, the researcher experienced that qualitative research took a great amount of time and hard work. At times it caused frustration and

was a challenging experience. The researcher agrees with the experience of other qualitative researchers about the difficulties and time-consuming nature associated with data analysis (Rahman, 2017). She overcame these challenges through a work-life balance and reflective sessions with the supervisor and other academics. The researcher was also greatly encouraged by possible personal changes in cognitive processing and changed worldviews that the research enabled, as expressed by Rossman and Rallis (2017).

3.7 Research design

This study's research design consisted of two strategies i.e. Collaborative Action Research (CAR) as well as exploratory and descriptive case study research. The CAR was used as a vehicle for data gathering. The data were interpreted as the case of designing for tablet teaching.

3.7.1 Collaborative Action Research

Action research, the research methodology first used by Kurt Lewin, presented a rather radical alternative to the methodologies of the 1940s and 1950s. During the 1970s, curriculum development work by Stenhouse indicated that studies that include teachers as active participants, with the ability to make decisions in terms of pedagogics, were more successful (Given, 2012a). In short, action research reflects a continuous swinging movement between questioning and acting (Munn-Giddings, 2017). This explains why action research, in general, is chosen as research strategy when practice needs improving (Howell, 2015). Traditional action research studies consist of cycles that include actions related to investigation, the construction, execution, and evaluation of action plans, all while gathering and analysing the data (Given, 2012a).

Action research is valuable for professional development opportunities. It potentially decreases the gap between research and participants' practices (Given, 2012a; Munn-Giddings, 2017), since teachers are completely involved in the process (Bruce, Stagg-Peterson, & Flynn, 2011). In this design the participants, true to their name, are afforded the opportunity to actively participate in research contextualised within their own settings (Howell, 2015). Such contextualised research carefully considers the social context with its associated sets of culturally-embedded values and beliefs (Given, 2012a). Howell (2015) points to the advantage of including participants in

action research to avoid studies *about* participants that are done *without* them. In this way, the prevailing authority structure present in many other research designs (i.e. the researcher's points of view are often elevated above the participants' views) is avoided (Howell, 2015). In fact, action research studies are so context-embedded that researchers have the insider view of the situation (Given, 2012a; Munn-Giddings, 2017). The variety of perspectives gained through collaborative research provides different interpretations of the phenomenon, contributing viewpoints that would not have been possible otherwise.

In the work of Kasi (2010), CAR is identified as an ideal approach towards TPD opportunities for in-service English First Language teachers in Pakistan. The author values the potential of a CAR study to actively involve teachers in development opportunities that are maintained on a continuous basis, and not only presented as once-off courses. Pellerin (2011) involves four Canadian schools in CAR. Prasertsilp and Olfman (2014) plans for a study of the training for educational technology integration of 40 teachers in Thailand using CAR.

In this study's action research approach, CAR was employed as the vehicle for the study's TPD opportunity. The teacher participants had nine formal interactions with the CoP (including the researcher and all participants) throughout the study. During these interactions, the findings based on participants' shared experiences and understandings, were shared, verified, and extended. The researcher shared her interpretations with the participants (based on interview and observation data) for them to contribute further insights and share their experiences.

Five of the most important characteristics of CAR were identified by Capobianco (2007). Each of these characteristics are defined and then discussed as it applied to this study.

In the first place, CAR study problems are described in terms of an agreed-upon definition of the problem by the researcher and all the teachers involved. Participants are also involved in designing the aims of the study (Howell, 2015). At the very start of the study, during the first planning focus-group interview, participants had the opportunity to share their current practices and experiences of teaching with tablets and MS Teams. The participants indicated that the realities of online teaching during the Covid-19 pandemic also influenced their use of and necessity for using technology

in their teaching practices. Based on the participants' current experiences involving current practices, problems and challenges, the participants set personal and study goals.

In the second place, the practical, classroom-level problems and possible solutions are explored in a collaborative effort between all parties involved. This means that participants become involved in both the data gathering and analysis thereof by means of researcher-participant collaboration. Ultimately, changed actions are developed through the research process (Howell, 2015). The participants of this study became involved in the data gathering and analysis process when they used the *DDD* observation sheet to observe their own and members of the CoP's lessons. During reflective interviews, participants were afforded the opportunity to share their motivations behind their observations and debated around their different interpretations of the observation sheet.

The high-level involvement of participants (as mentioned above) allowed for the development of participants' research skills related to data gathering, analysis, and interpretation. This is the third key characteristic identified by Capobianco (2007). The research participants of this study were not only involved in the data gathering process by means of lesson observations and reflections, but also by contributing their insights to gaps found in the observation sheet. These identified gaps enabled the participants to suggest and implement certain improvements to the *DDD* observation sheet, specifically aimed at the observation of English and Afrikaans language teachers' practices.

The fourth characteristic is the value of reflections and Howell (2015) adds that these provide valuable data for the study. Such reflections occur in an ongoing fashion throughout the study, even enabling participants to evaluate the success of the study (Howell, 2015). In this study, specific interview questions and sessions focused on teacher reflections. The researcher valued the evaluation of the study by the participants, since that provided valuable insight into successful and unsuccessful practices for TPD and CoP construction.

The final characteristic identified by Capobianco (2007) is the influence that research results have. Since this research design is so practice-embedded, the practical implications as well as the theoretical gains of the study can be combined to form a

coherent whole (Given, 2012a). The results from studies like these are not only published for the wider academic audience (i.e. contributing to theoretical knowledge), but also succeed in improving educational realities (i.e. practical value). The high levels of involvement made possible by CAR enable the study to adequately address the pressing issues as addressed (Howell, 2015).

As the researcher and the participants collaborated, changes were more easily implemented because participants experienced that their inputs were valued. Moreover, the participants felt better supported to change their practices when the researcher collaborated with them (Howell, 2015). In this study, participants' practices were altered to various degrees based on the inputs from the CoP and the descriptions of the *DDD* observation sheet as executed in participants' own teaching contexts.

CAR presents several other advantages. While in-service teachers can experience a lack of time for research, the distribution of research responsibilities among colleagues (i.e. within a CoP) makes this type of research more feasible to undertake (Kasi, 2010). Since teachers might be unwilling to undertake research owing to their limited research skills, the qualitative design of CAR that involves reflection, regular meetings, and collegial interaction removes some of the fears of conducting research possibly present in participants (Kasi, 2010). According to Atay (2006), the combination of well-structured, theoretically founded training, accompanied by teachers conducting classroom, practice-oriented research, can be regarded as a highly efficient TPD opportunity posing many benefits.

CAR is subject to challenges leading to some criticism of the design. CAR has the potential to be controlled by role players other than the teachers involved (Frankham & Howes, 2006) and this defeats the collaborative effort of the design. Given (2012a) also cautions that a collaborative relationship between the researcher and participants need to be maintained to protect the sensitive power relations. These relations need protection, since they determine the ethics of the research (Given, 2012a). This can also contribute to participants' low-level motivation to take ownership of the study as well as increased resistance to change (Bruce et al., 2011). The researcher remained cognisant of the power relations and simultaneously guided the study, but also provided for ample participant contributions.

Another challenge that researchers conducting collaborative research can encounter, is the time and effort required for the establishment of rapport and trust relationships among the researcher and the participants (Pushor, 2012). Fortunately, in this study's setting, the four participants were already well acquainted and had existing friendships and collegial relationships. This eased the interaction among CoP members. The participants also displayed a willingness to involve the researcher in their lived teaching experiences.

The validity and reliability of research findings based on practitioners' interpretations is another point of criticism against CAR (Bruce et al., 2011). This is mentioned owing to participants' lack of ability to make reliable, valid statements, especially true in small-scale studies. To counter this criticism, Bruce et al. (2011) suggests that both the researcher and the participants' skills are improved through CAR interactions.

As the researcher was intricately involved and immersed in the research context, the danger existed that she could become so involved that she failed to regard the situation from an outsider perspective as well. This was counteracted through continuous reflection, also on the part of the researcher (Munn-Giddings, 2017). The researcher needs to reflect on how her own personality and background influence the research (Munn-Giddings, 2017). The researcher wrote down her assumptions at the start of the study, stating what was known about the phenomenon, and what the expected outcomes were.

The roles of the researcher and participants need to be clearly defined in CAR. Since the participants are co-researchers (Pushor, 2012), the researcher's role will differ from the traditional. Kasi (2010) indicates that CAR researchers need to act as guiding facilitators that assist participants to construct their own meanings, practices, and theories. With clearly defined roles and meetings at regular intervals between the researcher and participants, the goals, plans, data and findings are the products of all the parties involved (Bruce et al., 2011). The researcher aimed to fulfil the role of facilitator.

There are many different models illustrating the process of both action research and CAR. This study aimed to explore the phenomenon of teachers' design experiences of teaching with tablets and MS Teams while employing *DDD*. To explore this phenomenon to its full extent, CAR as subtype of Action Research was employed,

since a collaborative effort between the university researcher and teacher participants was established (Bruce et al., 2011; Oja & Pine, 1987).

According to Oja and Pine (1987), CAR can be classified as phenomenology. Howell (2015) extends this notion by referring to the ability of action research to not only influence the phenomena under study, but also change practice. It is this flexibility of the research design that provides the greatest benefit for making change happen (Given, 2012a). The commitment to change in action research also distinguishes the design from other designs that merely explore a phenomenon or provide some descriptions without effecting change (Munn-Giddings, 2017).

The overarching design of CAR that includes Plan – Act – Observe – Reflect, as identified by Zuber-Skerritt (1992), was followed for the data gathering process, but each of the steps included various phases. For this study, two cycles were conducted as indicated in Figure 3-4. Every cycle fed into the next (Munn-Giddings, 2017), since the reflection of cycle one provided the aims for the second cycle's planning, lesson design, and reflection. In the first cycle, after identifying participants' needs and goals, participants had to plan lessons for their tablet classrooms using the *DDD* elements and observation sheet as contained in the literature. The participants designed and presented a second lesson based on the suggested changes to *DDD* (its elements and the observation sheet) as informed by their practices and participant reflections on their first lessons. The reflections of cycle 2 revealed that participants' digital didactical designs were well-defined, and suggestions were made as to how the observation sheet could be used to collaboratively explore digital didactical designs within specified tablet classrooms in a South African context.

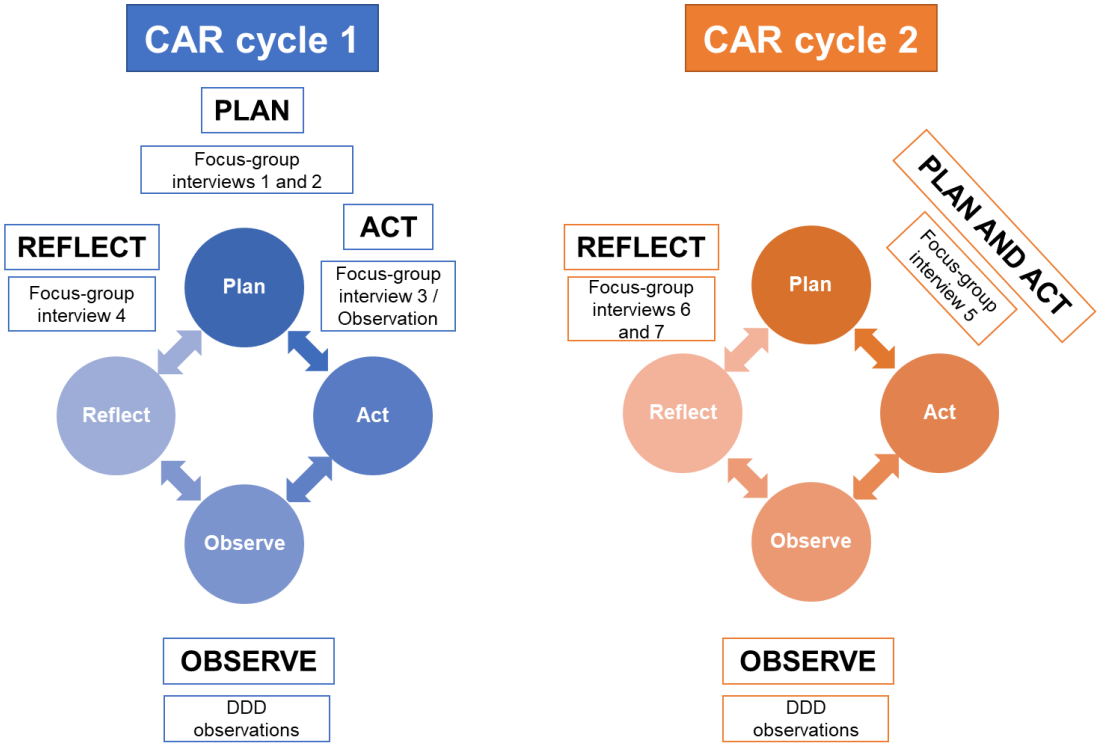


Figure 3-4. Collaborative Action Research cycles

Table 3-1 provides a detailed summary of the applied CAR methodology used in the study. Under every action research phase, the actions followed, documents generated, relevance to the research and the persons involved are indicated.

Table 3-1. Summary of the CAR methodology of this study

Date of completion	Time and location	Data gathering technique	Purpose	Documentation	Method of analysis	Link(s) to research question(s)	Responsibilities of persons involved
CAR Cycle 1							
CAR1: Plan							
For every session	Own time	Focus-group interviews and observations sheets	Prepare content / materials / feedback for participants.	• PowerPoints with learning content • Interview questions • Observation sheets • Communication via email and WhatsApp group	N/A	All questions	**Researcher** All preparations
21 May 2020	14:00 via MS Teams	Audio and video recording	According to Swanborn (2018a), the first interview allows the researcher to gain access to the target school as research site. Introduce the study's purpose, aims and proposed schedule.	PowerPoint with background information	-	-	**Researcher** • Meet with contact person at the school. • Design invitation to possible participants. • Prepare meeting platform with help from David, the contact person • Design and present PowerPoint that provides an overview of the study. • Gather participants. **Possible participants** • Watch presentation. • Indicate willingness to participate.

Date of completion	Time and location	Data gathering technique	Purpose	Documentation	Method of analysis	Link(s) to research question(s)	Responsibilities of persons involved
27 May 2020	15:00 via *Blackboard Collaborate Ultra* using audio and video recording	Focus-group interview 1 (FI1)	**Planning of the study** • Explore participants' current and envisioned practices of tablets and Microsoft Teams as well as handling of online teaching (For participant profiles). • Discuss elements of good lesson design. • Identify personal *Teacher Digital Competencies.*	Audio-video recording and transcriptions	Content analysis and coding	SQ1 and SQ4	**Researcher** • Prepare the meeting platform. • Design interview questions. • Ask questions and guide the interview. **Participants** • Contribute to the discussion. • Consider 13 *Teacher Digital Competencies* beforehand to identify three.
11 June 2020	15:00 via *Blackboard Collaborate Ultra* using audio and video recording	Focus-group interview 2 (FI2)	• Discuss summarised participant profiles. • Design research goals and questions. • Introduce *DDD* and its observation sheet . • Introduce relevant concepts (i.e. *SAMR* model, teaching strategies, apps in MS Teams). • Negotiate study time frame.	• Audio-video recording of group interactions • PowerPoint with participant profiles, goal setting guidelines, introduction to *DDD*, teaching strategies, apps in MS Teams, *SAMR* model (researcher video) and possible study time frame.	Content analysis and coding	SQ1 and SQ4	**Researcher** • Provide summarised participant profiles. • Guide design of goals and questions. • Introduce the core elements. **Participants** • Approve profiles. • Contribute to goal setting. • Consider relevance of *DDD*. • Watch **SAMR** video.

Date of completion	Time and location	Data gathering technique	Purpose	Documentation	Method of analysis	Link(s) to research question(s)	Responsibilities of persons involved
CAR1: Act							
9/14 July 2020	15:00 via *Blackboard Collaborate Ultra* using audio and video recording	• Focus-group interview 3 (FI3) • Documents (CAR1 D)	Participants share their lesson ideas for the first lesson and receive feedback/input from the CoP.	• Teachers' lesson plans (where available) • Audio recordings	Content analysis and coding	SQ1 and SQ3	**Researcher** • Setup the session. • Allow every participant to share his / her plans. • Provide guidance to participants . **Participants** • Share lesson plans done in own time. • Provide support to the CoP support: At school and during interview
CAR1: Observe							
14 July – 5 August 2020	Designated period(s) per participant	• Video recordings of participants' lessons (MS Teams / smartphone recordings) (CAR1 V) • 12 Semi-structured observations using the *DDD* observation sheet (OBS 1)	• The researcher and participants observe lessons to determine and describe participants' digital didactical designs. • Every participant scores and comments on his/her lesson afterwards.	• Researcher observations: 4 (OBS1 R) • Peer-observations: 4 (OBS1 P) • Self-observations: 4 (OBS1 S)	Content analysis and coding	SQ1 and S3	**Researcher** • Prepare and send observation sheets. • Observe every participant's lessons. **Participants** • Afrikaans teacher participants observe each other's lessons. • English teacher participants observe each other's lessons. • Every participant scores and comments on his / her own lesson.

Date of completion	Time and location	Data gathering technique	Purpose	Documentation	Method of analysis	Link(s) to research question(s)	Responsibilities of persons involved
CAR1: Reflect							
6 August 2020	Afrikaans: 13:15/ English 14:00 via *Blackboard Collaborate Ultra* using audio and video recording	Focus-group interview 4 (FI4)	Use the completed *DDD* observation sheets to reflect on the lessons presented in CAR cycle 1.	Audio recordings and transcriptions (Reference will be made to observation sheets)	Content analysis and coding	PQ1 and SQ1 – SQ3	**Researcher** • Setup the session. • Ask questions based on lesson observations. • Guide the interview. **Participants** • Reflect on their own and peers' practice. • Reconsider interpretation of the observation sheet.

CAR Cycle 2							
Date of completion	**Time and location**	**Data gathering technique**	**Purpose**	**Documentation**	**Method of analysis**	**Link(s) to research question(s)**	**Responsibilities of persons involved**
CAR2: Plan							
Between CAR cycle 1 and 2	N/A	Updates to the observation sheet	Incorporate changes as suggested by the participants and their experiences during CAR cycle 1.	FI1	Content analysis	PQ, SQ1 and SQ2	**Researcher** • Update the observation sheet using participants' inputs.

Date of completion	Time and location	Data gathering technique	Purpose	Documentation	Method of analysis	Link(s) to research question(s)	Responsibilities of persons involved
CAR2: Act							
27 August 2020	14:00 via *Blackboard Collaborate Ultra* using audio and video recording	• Focus-group interview 5 (FI5) • Documents (CAR1 D)	Participants share their lesson ideas for the second lesson and receive feedback/input from the CoP	• Teachers' lesson plans (where available) • Audio recordings	Content analysis and coding	PQ, SQ1 and SQ3	**Researcher** • Setup the session. • Allow every participant to share his / her plans. • Provide guidance to participants. **Participants** • Share lesson plans done in own time. • Provide support to the CoP support: at school and during interview.
CAR2: Observe							
28 August – 25 September 2020	Designated period(s) per participant	• Video recordings of participants' lessons (MS Teams / smartphone recordings) (CAR2 V) • 12 Semi-structured observations using the *DDD* observation sheet	• The researcher and participants observe lessons to determine and describe participants' digital didactical designs. • Every participant scores and comments on his/her lesson afterwards.	• Researcher observations: 4 (OBS2 R) • Peer-observations: 4 (OBS2 P) • Self-observations: 4 (OBS2 S)	Content analysis and coding	PQ, SQ1 and SQ3	**Researcher** • Prepare and send observation sheets. • Observe every participant's lesson. **Participants:** • Two Afrikaans teacher participants observe each other's lessons. • Two English teacher participants observe each other's lessons. • Every participant scores and comments on his / her own lesson.

Date of completion	Time and location	Data gathering technique	Purpose	Documentation	Method of analysis	Link(s) to research question(s)	Responsibilities of persons involved
CAR2: Reflect							
6 & 12 October	English: 14:15 (6/10/2020) Afrikaans: 14:00 (12/10/2020) via *Blackboard Collaborate Ultra* using audio and video recording	Focus-group interview 6 (F!6 - English and Afrikaans)	• Use the completed *DDD* observation sheets to reflect on the lessons presented in CAR cycle 2. • Reflect on scores that were not ticked on the sheets as well as differences in scores.	Audio recordings and transcriptions (Reference will be made to observation sheets)	Content analysis and coding	PQ, SQ1, SQ2, SQ3	**Researcher** • Setup the session. • Ask questions based on lesson observations. • Guide the interview. **Participants:** • Reflect on their own and peers' practice. • Reconsider interpretation of the observation sheet.
15 October 2020	15:00 via *Blackboard Collaborate Ultra* using audio and video recording	Focus-group interview 7 (FI7)	Reflection on *Teacher Digital Competencies*; experiences with *DDD* and the observation sheet; value of the CoP; finale suggestions for adaptations to *DDD* and the observation sheet.	Audio recordings and transcriptions	Content analysis and coding	All questions	**Researcher** • Setup the session. • Ask questions based on the entire study. • Guide the interview. **Participants** Reflect on their own and peers' practice.

3.7.2 Case study

Case studies allow for the in-depth exploration of a case, or study unit (Stewart, 2017). A case, according to its Latin origin, refers to a specific entity (Swanborn, 2018b) as identified by the researcher (Stewart, 2017). Case study research is well-aligned to this study's philosophy of phenomenology, since it involves socially-oriented research aimed at understanding a specific phenomenon (Swanborn, 2018b). The phenomenon being studied as a case needs to be defined and bounded (Yin, 2018). Aligned to this study's research questions (Yin, 2018), the case for this study was four language teachers (English and Afrikaans) and their digital didactical designs for tablet classrooms. In terms of bounding the case, these teachers were studied within their context (Swanborn, 2018b) of a private school in Pretoria using MS Teams and tablets for teaching. The participants' actions, lesson designs, and interactions in the CoP were studied over a course of six months (i.e. May to October 2020).

Instead of conducting extensive, quantitative research, the researcher chose to focus on selected instances of the phenomenon under study whereby an intensive approach was followed as suggested by Swanborn (2018b). This approach allowed for a detailed, contextualised study reliant on various data sources. It also enabled the researcher to discuss explanatory details and changes or developments that occurred within the context through the course of the study. Such an intensive approach is popular among educational researchers (Swanborn, 2018b).

The case study researcher is cautioned to remain focused on the phenomenon and not the person representing the phenomenon. Without such a focus, the study becomes too focused with little reference to other people's experiences of the same phenomenon (Swanborn, 2018b). The researcher ensured to simultaneously provide thick, detailed descriptions while also focusing on the phenomenon of teachers' exploration of teaching with tablets, MS Teams, and *DDD*.

Yin (2018) classifies case studies as *descriptive*, *explanatory,* or *exploratory*. Descriptive studies illustrate groups or phenomena (Nieuwenhuis, 2016b); explanatory studies investigate a case at various levels towards the explanation of the phenomenon (Zainal, 2007); exploratory studies locate key issues in the data to enable investigation leading to in-depth understanding of the phenomenon (Nieuwenhuis, 2016b). This study began as an exploratory case study design

interwoven with a descriptive case study design. The exploratory design was chosen to start off with, because it allowed the researcher to launch an investigation of the phenomena at hand of which little was yet known. This use is suggested by Streb (2012). The phenomenon of teachers' digital didactical designs is a new concept to Computer-Integrated Education research in South Africa since the *DDD* theoretical framework had not been used in any South African studies before. The researcher, at first, tried to determine whether the *DDD* framework could be applied to the South African context and to what extent. This design was beneficial owing to its flexibility (Streb, 2012) in relation to research questions and methods. Such an explorative study was also flexible in its data gathering and analyses processes, since the on-site requirements of the research were incorporated in the overall research design (Streb, 2012).

As the researcher progressed with the exploration of South African teachers' digital didactical designs, a descriptive case study design was employed. This design enabled the researcher to provide in-depth descriptions of teachers' designs and experiences of designing for tablet classrooms using the *DDD* framework. A description of what was already known about the phenomenon (i.e. teachers' designs for tablet classrooms) was provided in the literature review and the profiles of the participants. One of the main goals of the descriptive case study design was the search for patterns in the data (Tobin, 2012).

The descriptive case study provided detailed descriptions of the participants in their contexts. This was accompanied by clear descriptions of the realities experienced within the case under study. The findings of descriptive studies are also more generalisable (Tobin, 2012).

3.8 Methods

3.8.1 Sampling

For case study research, the selection of cases needs consideration. This study's population, sample frame, and sample are represented in Figure 3-5.

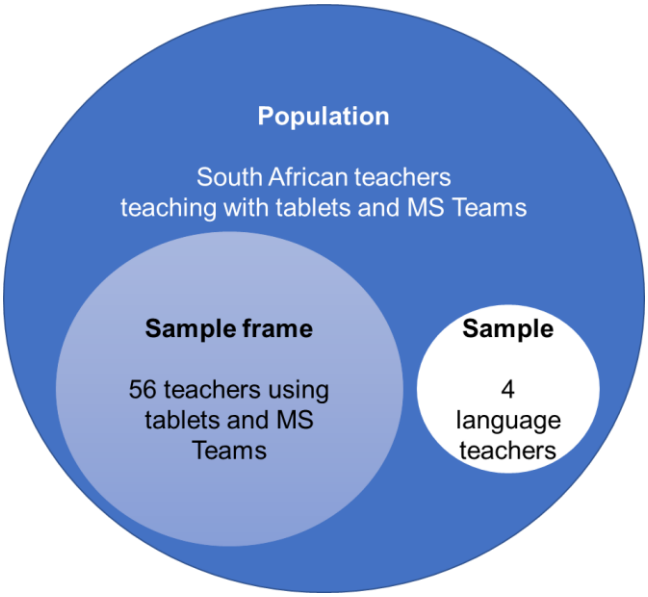


Figure 3-5. The study's population, sample frame and sample

From the population of South African teachers, a sample frame of 56 teachers was drawn from all the teachers teaching at the target school. The selected sample of the study was four language teachers (two male English Home Language and two female Afrikaans First Additional Language teachers). They were identified through purposive, homogenous, convenience sampling. The sampling was done to identify research participants with specific traits as suggested by Maree and Pietersen (2016). The sampling types are elaborated on in Table 3-2. In terms of purposive sampling, the pairs of teachers who teach the same language (English and Afrikaans) could more easily observe and reflect on each other's lessons. Teacher interest in the study was another important consideration, since the study required significant teacher time for planning, reflections, and interviews. Convenience sampling provided easy, convenient access to the participants (Maree & Pietersen, 2016).

Table 3-2. The study's sampling types

Purposive	Homogenous	Convenience
• Two Afrikaans and two English language teachers • Interest in TPD of the study	• Teachers from the same school	• Researcher's acquaintance at the research site approached possible participants.

Table 3-3 provides the demographic information of the participants in the sample. The participants' levels of tablets and MS Teams usage for teaching purposes varied, but all of them demonstrated an active interest in developing their skills of teaching with tablets and MS Teams.

Table 3-3. Participant demographics

Participant (Pseudonym)	Gender	Age	Subject	Years of teaching experience
David	Male	25 - 30	English	6 - 10
Roy	Male	40 - 45	English	1 - 5
Lily	Female	25 - 30	Afrikaans	6 - 10
Alexis	Female	25 - 30	Afrikaans	1 - 5

Based on the study's sample, the unit of analysis is both at an individual level (i.e. every participant's own designs, plans, reflections, and inputs) as well as group level (i.e. interaction among group members).

3.8.2 Data gathering and documentation

As indicated in the discussion of CAR, the two cycles presented in Figure 3-4 were employed for the data gathering of this study. In Table 3-1, a summary of the methodology action plans was included.

The main data gathering methods used in this study were focus-group interviews, observations, and documents. These are popular data sources for case study research (Swanborn, 2018b). Such empirical methods enabled the researcher to gather the experiential data required for phenomenological studies (Adams & Van Manen, 2012). While some structure was provided to guide the interactions and reflections, participants' descriptive anecdotes provided the data for this study, as described by Adams and Van Manen (2012). Each data gathering method is discussed.

3.8.2.1 Observations

"Observation is the systematic process of recording the behavioural patterns of participants, objects and occurrences without necessarily questioning or communicating with them." (Nieuwenhuis, 2016c, p. 90). For this study, two types of observations were employed. The first type, the observation of participant interactions in the CoP while designing for their MS Teams lessons using tablets and *DDD*, was less structured. The researcher asked questions during the observations, but

remained open to any data emerging from this action process while being immersed in the process. The researcher's role during these participant interactions was that of "participant as observer" (Nieuwenhuis, 2016c, p. 91). Nieuwenhuis (2016c) explains that this role allows the researcher to adopt an emic stance while collaborating with the research participants to develop their lesson designs. Within this role, the researcher was permitted to intervene and alter the interactions. This role was well-suited for the CAR context (Oja & Pine, 1987).

The second type of observation was semi-structured and based on the observation sheet from *DDD* (Jahnke et al., 2017). For these classroom observations, different forms of participation were employed. The researcher and CoP members observed the lesson as observer-participants. The observer-participants were not physically present in the observed setting (i.e. the classroom), but watched recorded videos of the classes due to Covid-19 access restrictions. As suggested by Nieuwenhuis (2016c), the observers could make their own interpretations without actual involvement in the course of the lesson that was observed.

Although observations provide deep insights, they tend to seldomly be objective (Nieuwenhuis, 2016c), therefore the researcher and the participants remained cognisant of their biases. Such biases were specifically addressed during the lesson reflection sessions (FI4 and FI6). The researcher and participants experienced that significant amounts of time were required to complete observations as indicated by Yin (2018). The researcher also had many notes that needed processing after the observations, a reality of observations expressed by Swanborn (2018a). Yet, these in-depth observations and notes provided deep insights into the phenomenon under study.

3.8.2.2 Interviews

Yin (2018) states that interviews are key information sources in case studies because they tend to provide explanations and participants' views. According to Adams and Van Manen (2012), two types of interviews are included in phenomenological studies. The interview aimed at phenomenology is concerned with the gathering of experiential descriptions, while the interview aimed at hermeneutics explores participants' interpretations (not causal explanations, but rather the conception of their experiential

descriptions). Both the experiential descriptions as well as the hermeneutics were gathered during the semi-structured focus-group interviews of this study.

Semi-structured focus-group interviews were used for this study. Semi-structured interviews have pre-developed interview questions, but allow for additional questions and/or comments to be included during the interview. The researcher had to guard against deviation from the topic, while also being open to unexpected utterances from participants as expressed by Nieuwenhuis (2016c), therefore the researcher guided the conversation at all times as suggested by Yin (2018). The researcher was aware, as alerted by Mears (2017), of the immense amount of time, patience and schedule coordination challenges that interviews required. The verbatim transcriptions, although assisted by MS Word's Dictate function, still required an immense amount of time, mostly spent during the data gathering process.

The focus-group interviews were a continuous invaluable information source throughout this study. These interviews collect detailed qualitative data on collective views of participants' experiences, personal interpretations of events, as well as attitudinal data (Gibbs, 2017; Nieuwenhuis, 2016c; Yin, 2018). They tend to elicit a wider range of responses (Nieuwenhuis, 2016c), are well focused on the study's target areas (Yin, 2018) and can either be experienced as less or more intimidating for individuals since group participation is required (Gibbs, 2017; Nieuwenhuis, 2016c). The focus-group interview allows for discussions and debating and can even encounter conflict situations; however, these interactions create rich data (Nieuwenhuis, 2016c). The researcher, however, needs to guard against over-involvement and should rather retain a more removed role (Nieuwenhuis, 2016c). By repeating these interviews, more in-depth data will be gathered (Gibbs, 2017).

The participants were familiar with each other, therefore the focus-group interviews were not intimidating. A good amount of healthy debate and critical thinking emerged among the participants, while mutual influencing of thought patterns did occur at times. While the researcher guided the interviews, the participants had the freedom to introduce their own topics as well.

Focus-groups have the potential to bring about educational change (Gibbs, 2017). Limitations of focus-group interviews include small, not representative samples; all participants need to simultaneously contribute to the discussion, often in one location;

participants' opinions may be unduly influenced by group members' inputs. The time-and-place challenge was addressed by the researcher hosting online interviews via the university's online software called *Blackboard Collaborate Ultra*. Here, data issues, connectivity problems and the recording of conversations could counterfeit the interviews' productivity as suggested by Gibbs (2017). Despite the possible challenges, online interviews decreased costs and improved convenience (Gibbs, 2017).

The Covid-19 pandemic necessitated the researcher to conduct all interviews and observations online. While this eased the recording process, it influenced the quality of interactions among the researcher and participants to some extent. At times, some participants could not attend the sessions (at short notice), so the researcher conducted separate sessions with the individuals who might have missed some of the sessions. Wi-Fi issues, specifically, were some of the things that hindered effective participation in these online sessions at times.

3.8.2.3 Documents

When using documents for data collection, any written documents related to the study can be used (Nieuwenhuis, 2016c). For this study, primary data sources that were produced by the research participants through the course of the research endeavour were used. Since subjective interpretations can be included in documents, documents do not suffice as stand-alone data, but need to be supported by other techniques as well (Nieuwenhuis, 2016c). Where entries needed clarification, it was done in the CoP discussions. The documents used for this study included participants' lesson plans (when available), lesson materials, as well as completed *DDD* observation sheets (for self- and peer-assessment purposes).

According to Yin (2018), documents are advantageous to use because these can be revisited as often as needed. The details contained in these documents also tend to be very specific (Yin, 2018). The disadvantages of documents, on the other hand, include access difficulties (Yin, 2018) where the researcher was dependent on participants to provide the relevant documents. The researcher overcame this challenge through frequent follow-up and a communal OneDrive folder where participants could share their materials. Some materials were shared via email as well.

3.8.2.4 Abbreviations used to refer to data sources

Since many data sources were created during the two cycles of CAR, every data source was assigned an abbreviation to ensure easy reference to the original data sources in the research report. These abbreviations are included in Table 3-4.

Table 3-4. Abbreviations of data sources used during the study

Phase of CAR	Data source	Topic	Abbreviation
CAR cycle 1			
Plan	Focus-group interview 1	Participant profiles	FI1
Plan	Training and focus-group interview 2	Elements of *DDD*	FI2
Act	Focus-group interview / observation 3	Planning for lesson 1	FI3
Observe	*DDD* observation sheets	Self (S), peer (P), and researcher (R) observation	OBS1 David S/P/R OBS1 Roy S/P/R OBS1 Lily S/P/R OBS1 Alexis S/P/R
David • CAR1 David V1: 1st video of lesson • CAR1 David V2: 2nd video of lesson	**Roy** CAR1 Roy V1: Video of lesson	**Lily** • CAR1 Lily V1: 1st video of lesson • CAR1 Lily V2: 2nd video of lesson	**Alexis** • CAR1 Alexis V1: 1st video of lesson • CAR1 Alexis V2: 2nd video of lesson
Observe	Lesson documents	Documents / materials used for lesson design	CAR1 David D CAR1 Roy D CAR1 Lily D CAR1 Alexis D
David • CAR1 David D1: Activity prompt • CAR1 David D2: Poetry analysis guide	**Roy** None	**Lily** • CAR1 Lily D1: Lesson plan • CAR1 Lily D2: Activity prompt	**Alexis** None
Reflect	Focus-group interview 4	Reflection on lesson 1 and digital didactical designs E (English) and A (Afrikaans)	FI4E FI4A

CAR cycle 2			
Plan / Act	Focus-group interview 5	Planning for lesson 2	FI5
Observe	*DDD* observation sheets	Self (S), peer (P), and researcher (R) observation	OBS2 David S/P/R OBS2 Roy S/P/R OBS2 Lily S/P/R OBS2 Alexis S/P/R
David CAR2 David V1: 1st video of lesson	**Roy** CAR2 Roy V1: Video of lesson	**Lily** • CAR2 Lily V1: 1st video of lesson • CAR2 Lily V2: 2nd video of lesson • CAR2 Lily V3: 3rd video of lesson • CAR2 Lily V4: 4th video of lesson	**Alexis** • CAR2 Alexis V1: 1st voice recording of lesson • CAR2 Alexis V2: 2nd voice recording of lesson • CAR2 Alexis V3: 3rd voice recording of lesson • CAR2 Alexis V4: 4th voice recording of lesson
Observe	Lesson documents	Documents / materials used for lesson design	CAR2 David D CAR2 Roy D CAR2 Lily D CAR2 Alexis D
David • CAR2 David D1: Activity prompt • CAR2 David D2: Peer assessment form • CAR2 David D3: Learner videos	**Roy** • CAR2 Roy D1: Activity prompt • CAR2 Roy D2: Learner videos	**Lily** • CAR2 Lily D1: Activity prompt • CAR2 Lily D2: Rubric • CAR2 Lily D3: Learner videos	**Alexis** None
Reflect	Focus-group interview 6	Reflection on lesson 2 and digital didactical designs E (English) and A (Afrikaans)	FI6E FI6A
Reflect	Focus-group interview 7	Reflection on the study	FI7

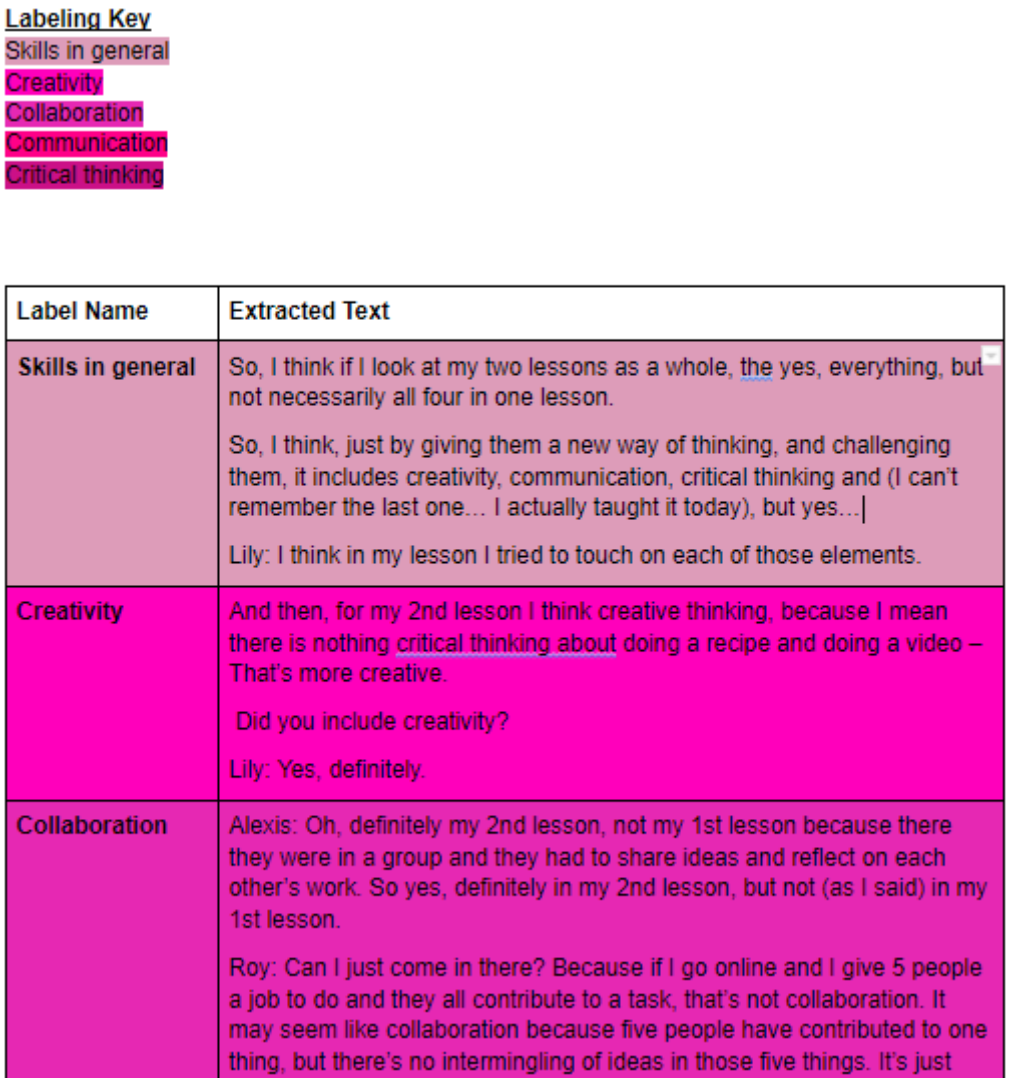
3.8.3 Data analysis and interpretation

Qualitative data-analysis occurs continuously and iteratively during and after data gathering (Nieuwenhuis, 2016a; Payne & Payne, 2011). Since a lot of data were gathered during this study, content analysis and coding were useful as relevant data analysis methods. By using coding, the data were reduced (Schreier, 2013) in a systematic fashion (Given, 2012b; Hsiu-Fang & Shannon, 2018; Schreier, 2013). The codes captured smaller data pieces as suggested by Saldaña (2013) and further content analysis assisted with pattern recognition as well as theme identification

across all the data sources (Given, 2012b; Hsiu-Fang & Shannon, 2018; Saldaña, 2013).

Content analysis is a relevant analytical method for case studies with data such as focus-group interviews and video recordings (Hsiu-Fang & Shannon, 2018) that were used during this study. A combination of inductive and deductive content analysis was done since both can be used in content analysis (Hsiu-Fang & Shannon, 2018).

The researcher transcribed interviews verbatim. For first-level coding, the researcher used MS Word and MS PowerPoint to represent the codes. During second-level and consecutive coding rounds, the researcher made use of colour-coded phrases without numerical values in Google Docs. An example of the Google Docs coding is provided in Figure 3-6.


Labeling Key
Skills in general
Creativity
Collaboration
Communication
Critical thinking

Label Name	Extracted Text
Skills in general	So, I think if I look at my two lessons as a whole, the yes, everything, but not necessarily all four in one lesson. So, I think, just by giving them a new way of thinking, and challenging them, it includes creativity, communication, critical thinking and (I can't remember the last one… I actually taught it today), but yes… Lily: I think in my lesson I tried to touch on each of those elements.
Creativity	And then, for my 2nd lesson I think creative thinking, because I mean there is nothing critical thinking about doing a recipe and doing a video – That's more creative. Did you include creativity? Lily: Yes, definitely.
Collaboration	Alexis: Oh, definitely my 2nd lesson, not my 1st lesson because there they were in a group and they had to share ideas and reflect on each other's work. So yes, definitely in my 2nd lesson, but not (as I said) in my 1st lesson. Roy: Can I just come in there? Because if I go online and I give 5 people a job to do and they all contribute to a task, that's not collaboration. It may seem like collaboration because five people have contributed to one thing, but there's no intermingling of ideas in those five things. It's just

Figure 3-6. Example of coloured codes in Google Docs

Since both coding and content analysis are iterative in nature, the researcher frequently revisited the data before the coding frame was set as suggested by Schreier (2013). First-level coding, specifically provisional coding, was done. Provisional coding provided the researcher with a starting list of codes based on the conceptual framework (Saldaña, 2013) (i.e. the *DDD* framework by Jahnke et al. (2017). This was a deductive coding scheme as described by Hsiu-Fang and Shannon (2018) and related to several aspects of the main research question. These codes are indicated in Figure 3-7.

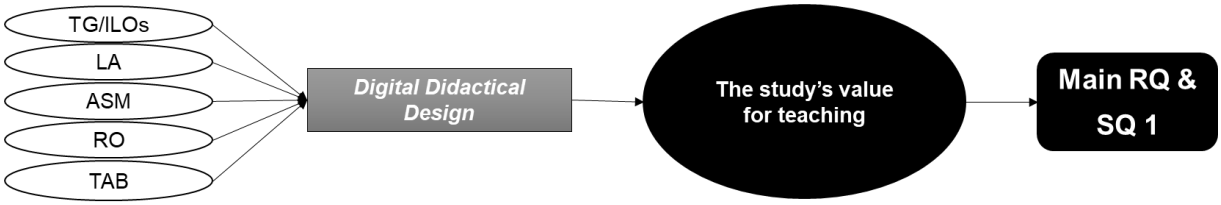


Figure 3-7. Coding scheme for the study's value for teaching (elements of *DDD*)

The researcher's second-level coding, completed during the data gathering stage, also involved provisional codes from the conceptual framework and the research questions as suggested by Saldaña (2013). These codes focused on surface and deep learning as well as levels of technology integration. According to Saldaña (2013), second-level coding requires higher cognitive skills as the researcher is working towards themes. The codes and categories are included in Figure 3-8.

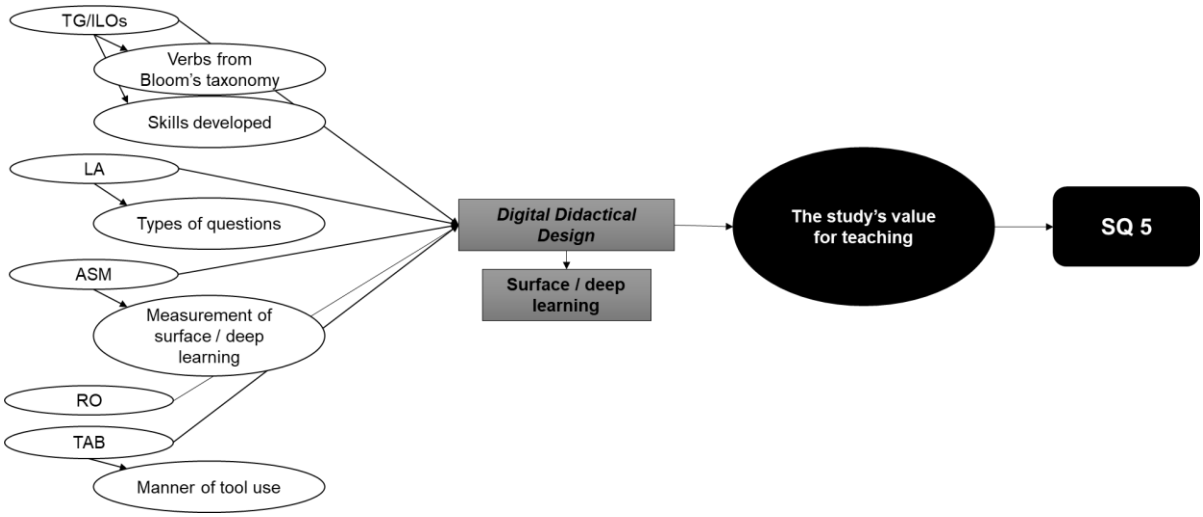


Figure 3-8. Coding scheme for the study's value for teaching (surface and deep learning)

After the two CAR cycles were completed, the researcher once again revisited all data using pattern coding. Pattern coding assisted the researcher in assigning code categories from which major themes were developed as the order and classification of codes changed, a normal process according to Saldaña (2013). This method mobilised the search for causes and explanations (Saldaña, 2013) as well as the representation of latent meanings present in the data (Hsiu-Fang & Shannon, 2018). This involved more of inductive coding to discover the latent content across the data sources in agreement with Hsiu-Fang and Shannon (2018). The gradual deepening in coding approach to reach categories and themes is illustrated by Saldaña (2013) and presented in a simplified format in Figure 3-9. Every coding scheme followed this pattern.

Figure 3-9. Data analysis: From codes to themes

(Saldaña, 2013)

Further coding schemes and their relation to the research questions are indicated in Figure 3-10 to Figure 3-14. Each coding scheme starts off with the codes to the left that are combined into categories in the rectangles. The various categories then feed into the theme with an indication of which research question the theme addressed.

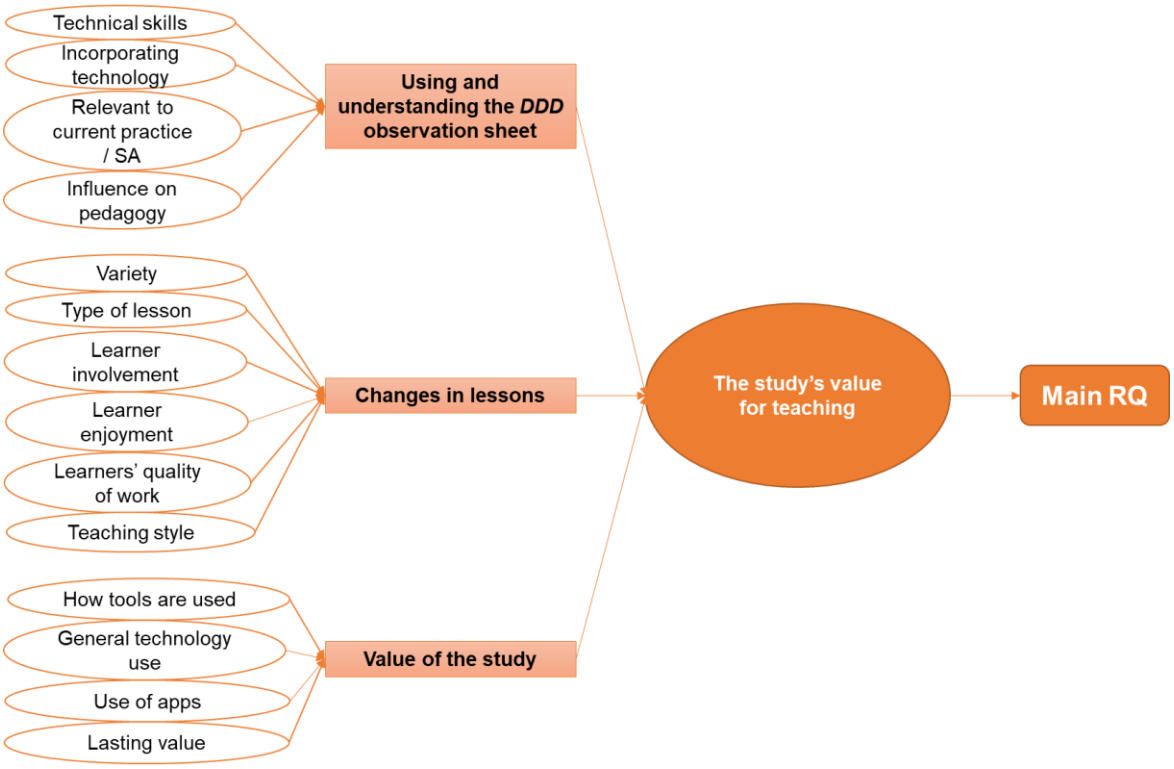


Figure 3-10. Coding scheme for the theme of 'The study's value for teaching'

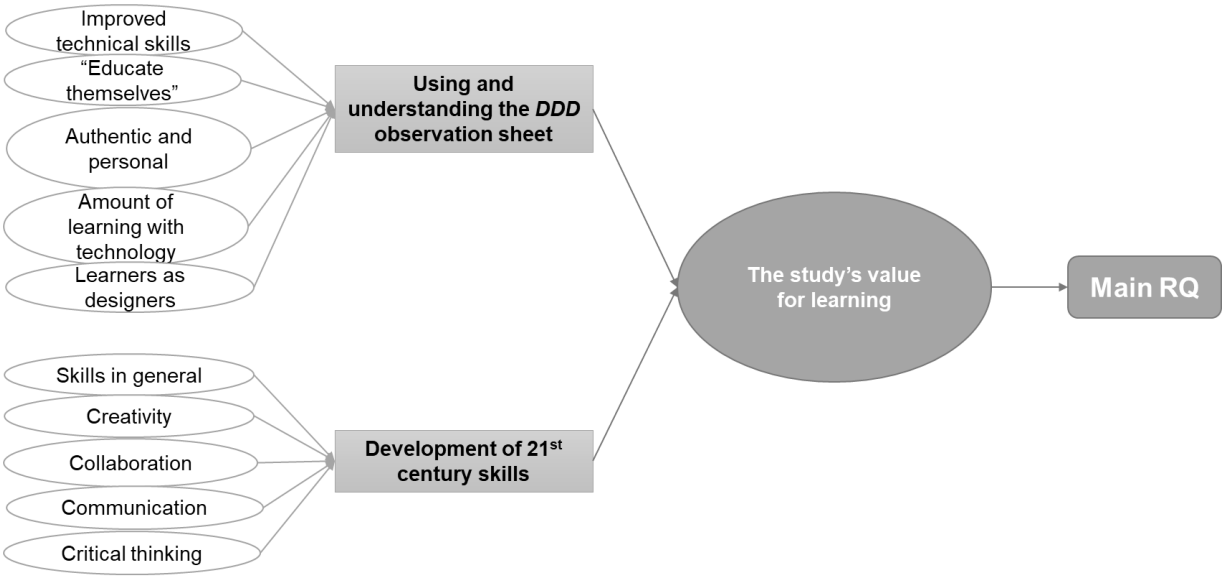


Figure 3-11. Coding scheme for the theme of 'The study's value for learning'

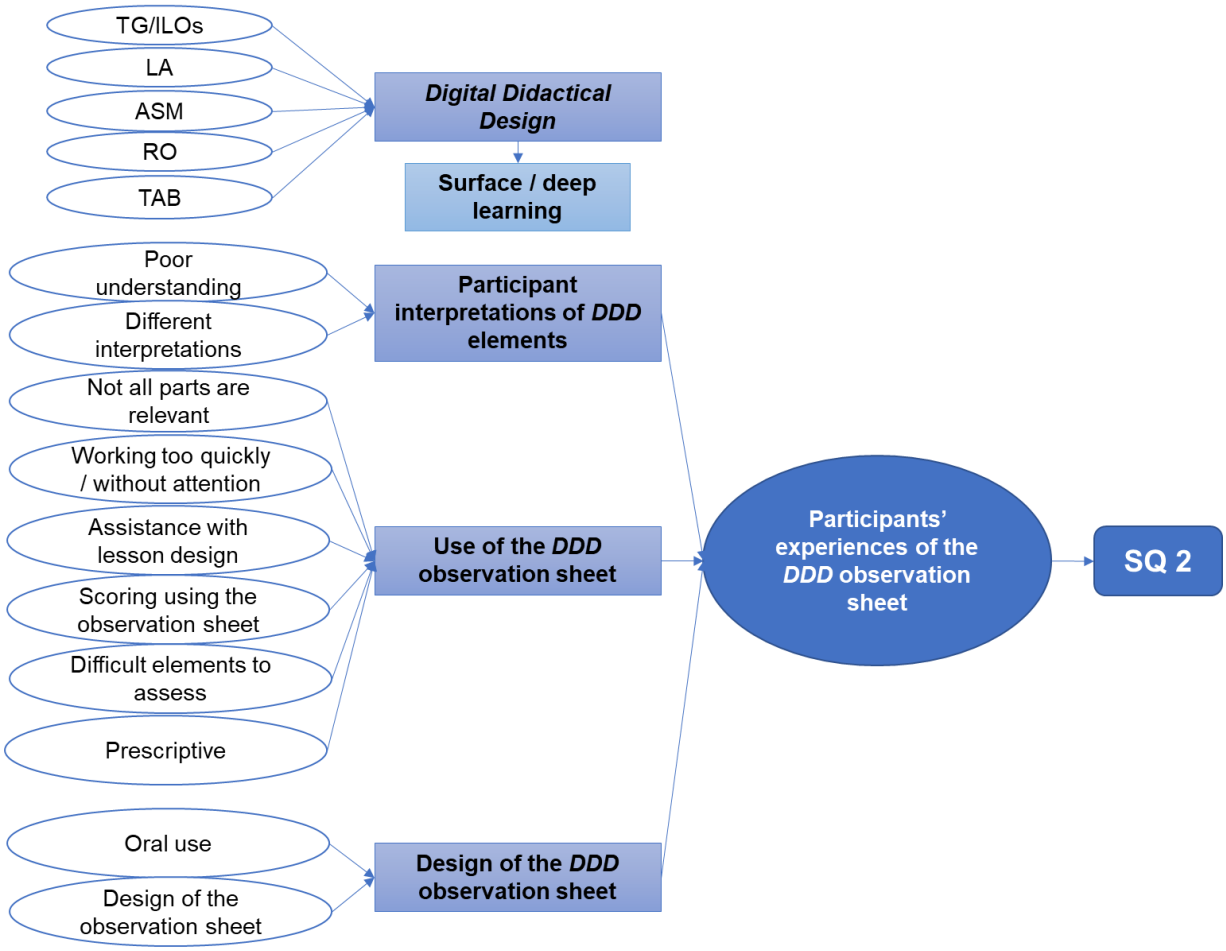


Figure 3-12. Coding scheme for the theme of 'Participants' experiences of the *DDD* observation sheet'

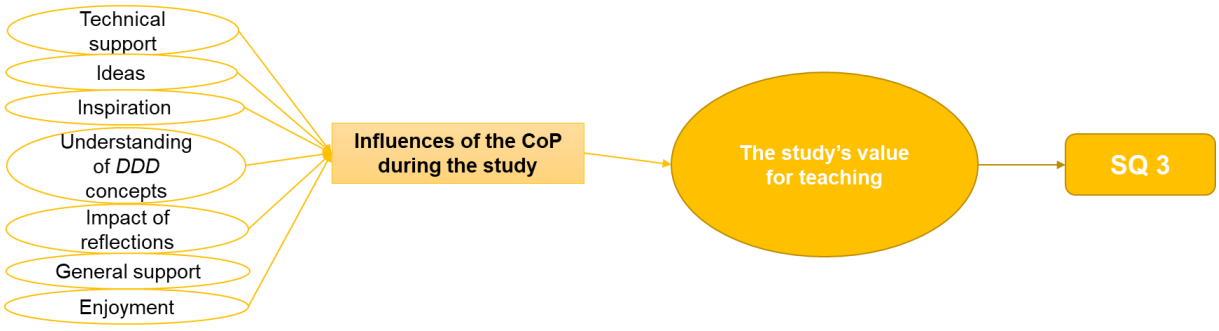


Figure 3-13. Coding scheme for the theme of 'The study's value for teaching (Influence of the CoP)'

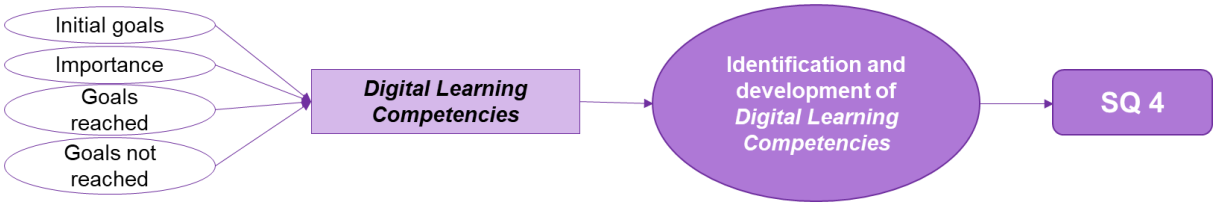


Figure 3-14. Coding scheme for the theme of 'Identification and development of *Digital Learning Competencies*'

While content analysis and coding do not necessarily succeed in theory development (Hsiu-Fang & Shannon, 2018), this was not the main aim of the study. The coding method enabled a systematic reworking of the data that remained focused on the research questions, whereby the researcher's personal assumptions and assumed findings were decreased, as suggested by Schreier (2013). In the end, the themes were comprehensive and unique (i.e. no overlapping) as suggested by Given (2012b) and focused on the meanings relevant to the study's research questions as suggested by Schreier (2013).

3.9 Quality criteria

According to Lincoln and Guba (1985), four criteria need to be adhered to in ensuring the trustworthiness of the study. These criteria include credibility, transferability, dependability, and confirmability.

The first criterium, credibility, is defined as the correlation between the study's findings and the reality (Nieuwenhuis, 2016a). Interviews' credibility and trustworthiness, according to Nieuwenhuis (2016c), are determined by four characteristics, i.e. reproducible, systematic, credible, and transparent. Interviews that elicit the same information when repeated, are reproducible. Through systematic interviews and the analysis thereof, the researcher ensured that the generated data did not simply represent her pre-conceived ideas. The type of questions and the way in which they were asked promoted truthful responses. Meticulous recording of interviews, their methods of collection and analysis ensured transparency as well.

Furthermore, the trustworthiness and credibility of the content analysis was ensured by multiple analyses of the data to identify similarities and contrasts (Given, 2012b). The researcher also clearly explained how the data analysis was done to ensure the trustworthiness of the study as suggested by Nowell, Norris, White, and Moules

(2017). This included in-depth descriptions of data sources, motivation for analysis methods used, as well as an in-depth description of the methods used.

Triangulation occurred in two ways. Multiple observers of lessons (i.e. the researcher, the self-observer and the peer-observer) observed every lesson using the *DDD* observation sheet. Secondly, the study employed various data gathering instruments (i.e. focus-group interviews, observations, and documents) that could confirm the truthfulness across the data sources.

Reliability or the trustworthiness of gathered data points to accurate representations of participants' experiences (Gibbs, 2017). During the research process, the researcher ensured that the research questions were well-aligned to the conceptual framework. The researcher also made use of quality instruments, such as the *DDD* observation sheet standardised by the authors (Jahnke et al., 2017) to reduce the threat to internal and external validity (Creswell & Plano Clark, 2018). The researcher had regular sessions with the study supervisor and did frequent member-checking throughout the research process (Gibbs, 2017), including member-checking of coded data (Saldaña, 2013).

Figure 3-12 indicates the poor understanding or different interpretations of *DDD* elements as experienced by the participants. Participants' interpretations influenced their scores on the observation sheets. The observation scores for lesson 1 were more diverse among the observers due to these varied interpretations. The lesson 2 observation scores, however, had less differences owing to a more unified understanding of the concepts after discussions during the reflections (FI4 and FI6). The inter-rater reliability of the second lesson also increased because participants planned for technology-based lessons, therefore the elements of *DDD* were more easily observed. All participants valued the reflective discussions during the focus-group interviews (FI4 and FI6), since these clarified and aligned the variety of interpretations and scores awarded.

The second criterium of trustworthiness is transferability (Lincoln & Guba, 1985). While transferability does not require generalisation, it needs to allow the reader to relate the components of the specific research context to that of his / her own (Nieuwenhuis, 2016a). The researcher ensured transferability by checking to see that participants

were representative of the phenomenon. Through clear, in-depth descriptions of the study's context, the researcher enabled the reader to determine the extent of transferability to his / her own context as stated by Nieuwenhuis (2016a).

The third criterium for trustworthiness entails dependability (Lincoln & Guba, 1985). Dependability necessitated the researcher to effectively describe the details of the data gathering procedure by elaborating and reflecting on the data gathered with reference to its sources and techniques (Nieuwenhuis, 2016a). The researcher aimed to leave a significant audit trail as evidence of how and why the data was collected and analysed as suggested by Mears (2017).

The fourth criterium for trustworthiness is confirmability (Lincoln & Guba, 1985). It refers to the study's neutral nature and implies a study free from personal bias on the side of the researcher or the advancement of the researcher's personal interests or motivations (Nieuwenhuis, 2016a). The researcher stated her personal disposition and relation towards the research context. This was supported by thorough note-keeping, member-checking and frequent consideration of the study's intent as advised by Creswell and Plano Clark (2018).

3.10 Ethical considerations

When people are involved in studies, special ethical considerations need to be taken into account to ensure the protection of these participants (Yin, 2018). Figure 3-15 illustrates (clockwise from the top) the ethical procedures undertaken to gain the necessary ethical approval to conduct this study.

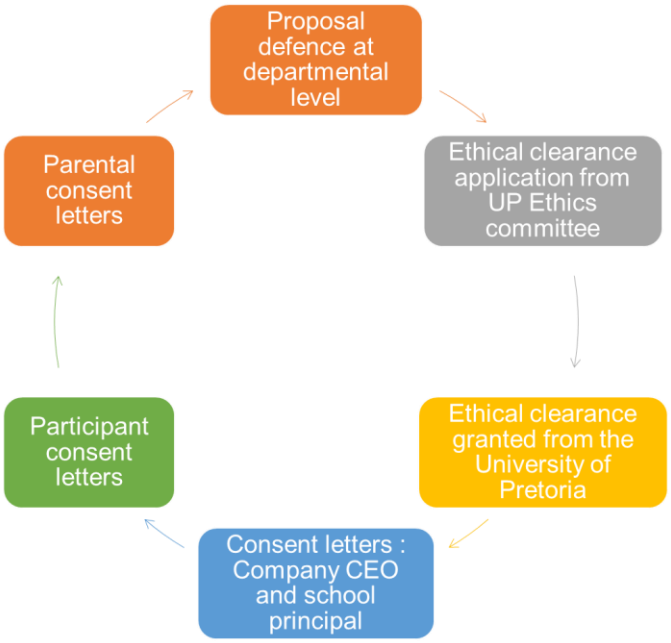


Figure 3-15. Ethical procedures of the study

Since this case study research involved people as participants, the study was firstly represented to a panel of critical readers during a departmental proposal defence. After some alterations were made to the proposed study, the proposal and all consent letters were reviewed and approved by the University of Pretoria Ethics committee (application reference number EDU046/20). The researcher's application benefitted from the research experience of the board members (Stewart, 2017), especially in terms of consent letter design (i.e. keeping the letter short, yet detailed enough). For the data gathering of the case study, the researcher had to gain access to the target school. This access was granted through permission from the school group's CEO, the school principal, all the research participants, and learners' parents. All of these parties signed official consent letters that permitted the researcher to use the data obtained during the research (Stewart, 2017). These consent letters included background information of the study (i.e. purpose statement) as well as the expectations from every participant in the study.

When conducting research, researchers need to be aware of the impact of the research on their participants (Mears, 2017). It is vital for the researcher to respect her participants, ensure informed consent and find ways to increase the study's benefits and minimise its risks (Mears, 2017). In this study, all participants participated voluntarily by means of informed consent. The initial informed consent was given

verbally (and recorded) since the researcher and participants could not meet in person at that stage, owing to lockdown regulations during the COVID-19 pandemic. The CEO, school principal and participants gave their written consent once they were back at school. Parents did not sign the consent letters, since an opt-out clause was added to these letters. No objections to the study were made by parents.

Participants were made aware of the implications, benefits and risks of the study (Aluko, Omidire, & Mampane, 2018). Within voluntary participation, research participants were allowed to withdraw from the research process at any given point without consequences (Aluko et al., 2018). One of the five initial participants withdrew from the study before presenting the first lesson. Fortunately, there were still four participants, and these were pairs of language teachers, so a relevant sample of participants could still participate in the study. The researcher respected the fifth participant's withdrawal and in this way, the participants were protected against any harm due to their participation in the study (Yin, 2018).

Participants' identities were protected by ensuring anonymity with the use of pseudonyms (Aluko et al., 2018). The audio-video recordings of all the interviews were done via *Blackboard Collaborate Ultra* in a training module. Only the researcher and the University (i.e. no university students or lecturers) had access to these recorded sessions. While participants' real names were used during the interviews, they were assigned pseudonyms during the transcription of the interviews.

Although confidentiality can be problematic within focus-group interviews since all participants hear other participants' responses (Gibbs, 2017), confidentiality was maintained by the researcher's ethical practice to not disclose confidential information to any persons within the school. The researcher conducted ethical research by upholding confidentiality in showing respect for the participants' human rights of privacy and dignity (Aluko et al., 2018). The University of Pretoria's ethical guidelines provided the foundation of the research.

3.11 Conclusion

This chapter provided a detailed discussion of the study's methodology. This included the philosophical orientation, expressed in the philosophy, ontology, epistemology, approach, and methodological stance. The research designs of CAR and case studies

were explored and applied to the study. The sampling method, as well as the procedures for data gathering, documentation, analysis, and interpretation were indicated. In conclusion, the quality criteria and ethical considerations as applied in the study were indicated.

CHAPTER 4. RESULTS AND FINDINGS

4.1 Introduction

Chapter 4 provides the study's findings as supported by the results. The topics as well as their relation to the primary (PQ) and secondary (SQ) research questions are included in Figure 4-1.

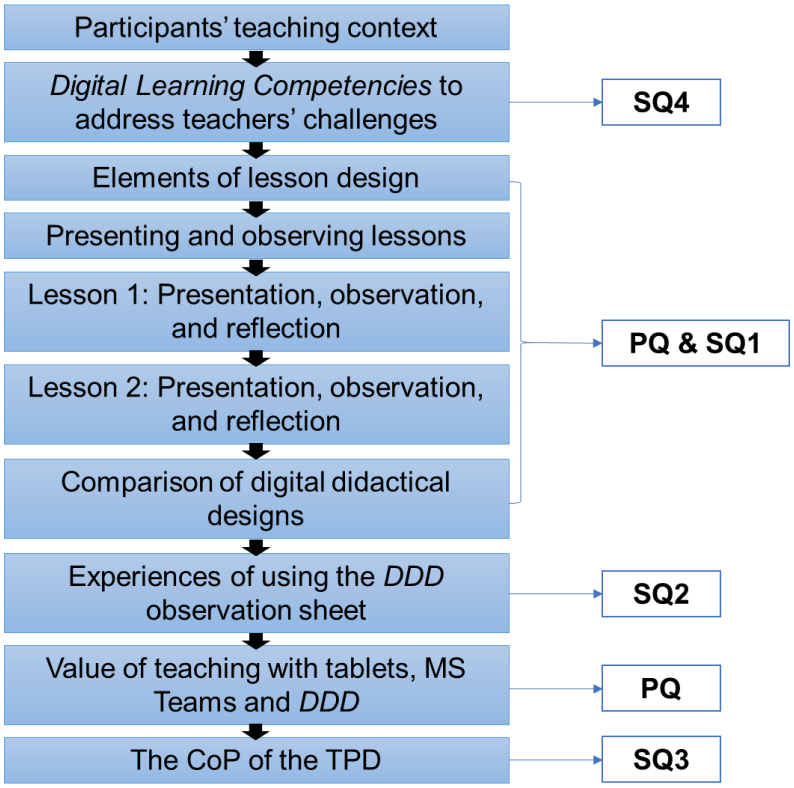


Figure 4-1. Overview of Chapter 4

4.2 Participants' teaching context

During 2020, a worldwide pandemic called Covid-19, affected all activities of South Africa, including education. During the early months of the pandemic, the target school reverted to online teaching using MS Teams. According to Roy, the pandemic's online teaching rather than the study necessitated participants to increase their digital tool usage (FI7). Alexis agreed that the move to online teaching changed her mind set (FI7). The impact of the pandemic on teaching varied among the participants. The SAMR levels of Lily and Alexis increased from mostly substitution-level use to augmentation-level digital tool usage (FI1). This included increased collaboration (FI1), and online assessments using MS Teams (FI1). Roy, on the other, did not experience a change in his technology integration levels (FI1), but only an increased

workload due to online teaching (FI2) as well as additional time spent to stand in for absent teachers (FI3).

The pandemic necessitated social distancing practices where all citizens had to wear masks in public and maintain 1,5 metres between each other. These measures were strictly adhered to at the target school as well. This hindered collaboration, a core element of *DDD*. Roy experienced the dividing of learners in class and online into groups as a challenge (FI3). Lily was frustrated by the inability to assign group work to learners. *("Not long before this lesson, we were once again reprimanded about the fact that we are not allowed to do groupwork in class.") (FI6A).* Since it was suggested to Lily to incorporate collaboration of some kind, she decided to use online peer assessment. The other participants, on the other hand, changed class assignments into group video assignments (Alexis' lesson 2) or had learners collaborate via MS documents and the MS Teams chat function (Roy and David in lesson 2). *("So, we were able to work in groups even though they didn't sit around working in a group - they worked online.") (Roy – FI6E).*

4.3 The development of teachers' *Digital Learning Competencies* to address their challenges during the study

The study identified the participants' challenges of teaching with tablets and MS Teams at the start to enable clear goal setting when choosing among the 13 *Digital Learning Competencies* as study goals.

4.3.1 Participants' challenges when teaching with tablets and MS Teams

At the start of the study, participants identified the challenges they faced while teaching with tablets, MS Teams and in the online environment. These challenges were classified as either *Someday* or *Monday* plans by Daccord and Reich (2015) as described in the literature review. Some of these challenges overlapped, but every participant handled it differently. Of the 29 identified challenges, 16 were classified as *Monday* plans. These were addressed during the study to improve or enhance participants' teaching practices. The other challenges were beyond the study's scope and resorted under *Someday* plans. The challenges are indicated in Table 4-1.

Table 4-1. Comparison of participants' challenges before and during the study

	Start of study	During the study (S: Someday plan M: Monday plan)
	Data source: FI1 and FI2	**All data sources**
David	Colleagues' buy-in for online marking	M: All four participants made use of online marking and/or online peer-assessment.
	Outdated devices	S: *Beyond the study's scope*
	Infrequent software updates	S: *Beyond the study's scope*
	Lacking training e.g. How to use PowerPoint	M: New understanding of the flipped classroom strategy as well as a different approach to using tools
	Need for 2-in-1 device / outdated devices	S: *Beyond the study's scope*
	Tools do not always work / glitches / bugs.	M: David's second lesson: MS PowerPoint did not have the same functionalities (e.g. voice recording) on mobile devices. Learners used their laptops at home.
	Connectivity issues e.g. slow Wi-Fi at the school	S: David's first lesson: Wi-Fi issues disabled fully-functional online collaboration for some learners.
	Learners' poor skills to use tools for academic purposes	M: Participants guided their learners in the use of the selected tools.
Roy	Teachers' unfamiliarity with a variety of tools	M: List of tools (possible apps) made and some were incorporated.
	Difficult to incorporate MS Teams in some subjects (e.g. Maths).	S: *Beyond the study's scope*
	Uneven use of technology across subjects	S: *Beyond the study's scope*
	Big variety of devices (i.e. cell phones, tablets, laptops, computers and parents' devices)	S: *Beyond the study's scope*
	Responses from many different platforms.	M: The platforms were mostly specified by the participants, but the learners of David and Alexis used other platforms during their second lessons as well.
	Online teaching takes more time.	M: Roy's planning for the second lesson did not take more time than usual (FI6E).
	Difficult to keep track of 80 learners and 4 subjects in online teaching.	M: Group work enabled less items, but the planning still took time.
	Time delay in responses during online teaching	N/A during the study
	Learners got bored with teachers' PowerPoint presentations (FI2).	M: Infrequent use of teacher PowerPoints Lesson 2: All lessons included learner instead of teacher presentations.
	Technology is only one of many ways to engage learners (FI2).	M: Roy presented lessons with and without digital tools.
	Technology can distract learners.	M: Digital tools employed for active, engaged learning
	Grade 7s' technical skills in MS Teams are not that advanced (FI3).	S: Lessons only planned for grade 10s.

Roy	**Start of study**	**During the study** **(S: Someday plan** **M: Monday plan)**
	Poor Wi-Fi connectivity (FI3)	S: *Beyond the study's scope*, but Roy did not experience this problem during his second lesson.
	Inaccessibility of the internet by learners (FI3)	S: *Beyond the study's scope*, but Roy did not experience this problem during his second lesson.
	Technical glitches waste academic time. (FI3)	M: Learners' poor understanding of the online peer-assessment process wasted time (45 mins).
Lily	Teaching grade 7s to use MS Teams takes up academic time.	S: Lessons only planned for grade 9s.
	Apps can't be used for Afrikaans.	M: Flipgrid and *Powtoon* were not language-specific.
	Not trained well enough in the use of tools	M: Felt more confident at the end of the study
	Teachers compete against the entertainment value of many other gadgets (FI2).	M: Learners were actively engaged in the learning activities, focusing on academic goals.
Alexis	Grade 7s struggle to complete assignments online.	S: Lessons only planned for grade 8s.
	Don't like online marking.	M: Online peer- and teacher assessment effectively used.

Participants spent more time planning their digital didactical designs for the study. They associated with ChanLin (2017) who pointed to many hours required for redesign. While they gained an appreciation for good integration of digital tools, they found this practice impractical to continue with daily. It was, however, encouraging to see that participants adopted many new roles as identified by two sets of authors (Groff & Mouza, 2008; Montrieux et al., 2015). The participants became facilitators, although Roy and Alexis felt less actively involved in the learning process due to this role.

David and Roy were concerned that the devices would cause distractions as Kim and Kim (2017) pointed out. Roy, Lily, and Alexis shared in the concern raised by Jahnke et al. (2014b) that younger learners tend to lack the technical skillsets to use digital tools for academic purposes. While Alexis presented one lesson to grade 7s, the other participants taught grades 8 to 10 who are more technically skilled. Especially during the second lessons, all participants actively involved learners in learning *with* the digital tools.

David and Roy identified Wi-Fi and interconnectivity issues as challenges, just as Jahnke et al. (2014b) did , but only David stumbled across connectivity issues and digital tool challenges during the study. During their first lessons, Roy and Alexis

presented their Teaching Goals / Intended Learning Outcomes (TG/ILOs) orally. During their second lessons, however, all participants presented their goals digitally, aligned to the notion of Jahnke et al. (2014b) that devices enable easier digital presentation of TG/ILOs. The participants found that the devices enabled deep learning to a greater extent, in contrast to Finnish teachers who could not identify the real value of the tools (Rikala et al., 2013). Roy and David did, however, experience that learners' over-relied on internet answers – which inhibited critical thinking as identified by Raney (2018). In general, based on participants' constructive alignment analyses, they managed to reach their deep learning outcomes, in contrast to the struggles experienced by the teachers in the study of Kim and Kim (2017).

4.3.2 Digital Learning Competencies

Participants had to study the 13 *Digital Learning Competencies* as summarised in Figure 1-2 that were also summarised in MS PowerPoint format by the researcher from the policy document (Department of Education, 2007). Every participant then identified three competencies as goals for the TPD study as indicated in Figure 4-2.

	David
2	Be reflective about challenging current digital learning and teaching practices.
6	Integrate digital tools and resources to enhance learning objectives in various learning environments.
13	Initiate peer support and collaborative, work-place learning.

	Roy
3	Understand the role of the teacher, the learner and the digital resources during digital teaching.
6	Integrate digital tools and resources to enhance learning objectives in various learning environments.
8	Transform learning through the innovative use of digital tools and resources.

	Lily
1	Adapt the habit of an enquiring mind regarding the educational value of using digital tools and resources.
5	Select appropriate digital tools and resources when fulfilling the roles of educator.
9	Enhance class management, assessment, and feedback processes through the use of digital resources.

	Alexis
1	Adapt the habit of an enquiring mind regarding the educational value of using digital tools and resources.
3	Understand the role of the teacher, the learner ,and the digital resources during digital teaching.
9	Enhance class management, assessment, and feedback processes through the use of digital resources.

Figure 4-2. Participants' three *Digital Learning Competencies* as study goals

The types of visions for tablet use by David and Lily allude to why they chose their specific *Digital Learning Competencies*. This is David's vision: *"I would want children and learners to be able to make their own presentations; to share and collaborate using platforms like MS Teams. I would like them to stop basically asking me to give*

them information but use the tablet in front of them to gather information and start reporting and using the information to collaborate to solve problems." (FI1). Owing to this, enhanced learning using devices (competency 6) as well as collaboration and work-life skills (competency 13) is expressed. Lily's goal was the following: *"Finding innovative ways to teach new content while using these tools." (FI1).* To identify the relevant tools, Lily had to have an enquiring mind (competency 1), develop the ability to select relevant tools (competency 5), and teach in innovative ways by incorporating tools for various purposes (competency 9).

On the question of why participants feel that the *Digital Learning Competencies* had to be developed, the participants' responses revolved around David's response as he was the first to answer. For David, both personal and professional development are important since his digital competence would translate into his learners' digital skills. This notion was fully supported by all the other participants. *(David: "Making sure that as a teacher you are actually not just developing yourselves, but also your learners - that's important for me, especially when we are moving into the digital age."). (FI1).* Roy added that the teacher's skills are transferred to the learners, therefore learners' digital learning is dependent on the teacher's command of the technology at hand. *(Roy: "There can't be any sort of learning of the skills unless the teacher himself has full command over it - It's his own development."). (FI1).* On the other hand, Roy added that the balance needed to be struck between online and normal teaching. *(Roy: "I also think that we must be careful that not everything becomes online because the whole of our world is not online."). (FI1).* While Lily agreed with the rest of the community that learners needed preparation for their work lives in a digital world, she sided with Roy's argument and indicated that not all skills could be taught through electronic means. *(Lily: "There are many skills that we can teach in the classroom that cannot be taught online or digitally."). (FI1).* Alexis fully agreed with David's indication of the need for personal and professional development, but also provided a practical goal for her own development pertaining to her demand over the technology at hand. *(Alexis: "I would really like to do online teaching with all the resources and, like it says, a habit (so, almost like a second nature. You know exactly what to do, how to do it. So, you feel more comfortable."). (FI1).*

After the initial introduction to the *Digital Learning Competencies*, participants did not refer to these competencies as goals until the end of the data gathering process. David

indicated that he forgot about the competencies and regretted it that he did not keep them in mind throughout the course of the study (FI7). By the end of the study, during the final reflection, participants were asked to reflect on whether and how they managed to develop their three identified competencies through the course of the TPD opportunity. Participants' competencies (indicated in red) were not addressed or developed, while competencies in green were developed.

David	
2	Be reflective about challenging current digital learning and teaching practices.
6	Integrate digital tools and resources to enhance learning objectives in various learning environments.
	FI7: "because I also learnt about things that I didn't know of before."
	FI7: "I didn't realise that PowerPoint is different on an iPad compared to a computer and that it's different on an iPad compared to a Samsung device. I didn't know that, so I thought that everything would look the same - that kind of compromised certain elements of that second lesson."
13	Initiate peer support and collaborative, work-place learning.
	FI7: "Even though it was good, for example, to speak to them about their ideas, because it helped me with my ideas."

Figure 4-3. Summary of David's *Digital Learning Competencies* during the study

Based on Figure 4-3, David indicated that he was not reflective about challenging current practices, while he learnt some new things about tools, especially the limited features of MS PowerPoint on mobile devices like tablets as experienced during his second lesson. He was extremely helpful in assisting the other CoP members, especially with technical matters.

Roy	
3	Understand the role of the teacher, the learner, and the digital resources during digital teaching.
6	Integrate digital tools and resources to enhance learning objectives in various learning environments.
	FI7: "We managed to integrate digital tools and I was able to successfully do that in the classroom situation and also, see how they impacted on the learning environment." FI7: "I gave you one very teacher-based and one very digital-based (lesson) and I think there is place still for both. I think that either too much of one or the other – it loses its impact."
8	Transform learning through the innovative use of digital tools and resources.

Figure 4-4. Summary of Roy's *Digital Learning Competencies* during the study

Roy's competencies are contained in Figure 4-4. Throughout the study, Roy could determine neither the amount of learning taking place within learners, nor the contribution of technology to learning, therefore competency 3 was not developed. Roy managed to include two contrasting lessons to showcase his ability to include digital tools in every element of the lesson. He succeeded in displaying his skills to

integrate digital tools and resources. Based on his SAMR levels, Roy showcased a significant ability to really transform his learning experiences using technology as seen in his contrasting first and second lessons.

Lily	
1	Adapt the habit of an enquiring mind regarding the educational value of using digital tools and resources.
	FI7: " I definitely went looking for ideas for these lessons and found some very interesting things (for example where I used the *Powtoon* in the second lesson). I never knew about that until I started researching that (or how to use it), so I definitely think that I adapted the lessons. I definitely extended my mind; I enquired (laughing) and therefore selected new things."
5	Select appropriate digital tools, and resources when fulfilling the roles of educator.
	FI7: "I definitely think I did that as well in order to get to the point of the lesson. I think I selected appropriate tools to give the lessons."
9	Enhance class management, assessment, and feedback processes through the use of digital resources
	FI7: "I definitely did that. Classroom management: I think I definitely learnt a lot with the switched classroom (flipped classroom) method that I used in my first lesson."
	FI7: "It definitely helped me with the assessment that I did (the online assessments) especially for the first lesson where we had the online assessment which was self-marking. It helped a lot. "
	FI7: "And then obviously the feedback process: I think I can still work on that, especially using digital tools for that. I think all three of those."

Figure 4-5. Summary of Lily's *Digital Learning Competencies* during the study

Lily managed to develop all three of her identified competencies, probably a high level of commitment to the study seen from her side from the start. This can be seen in Figure 4-5. She was dedicated to identifying and using relevant digital tools in her lessons, and incorporated assessment and feedback processes in an online format via MS Teams.

Alexis	
1	Adapt the habit of an enquiring mind regarding the educational value of using digital tools and resources.
	FI7: "I definitely realised the value of using technology and a different type of teaching technique. The class enjoyed it more. "
3	Understand the role of the teacher, the learner, and the digital resources during digital teaching
9	Enhance class management, assessment, and feedback processes through the use of digital resources
	FI7: "I would say definitely assessment because I did a peer assessment "

Figure 4-6. Summary of Alexis' *Digital Learning Competencies* during the study

Alexis also indicated that she managed to develop all three of her competencies as seen in Figure 4-6. She under-emphasised competency 3. She did, however, realise how valuable the use of digital tools was and managed to include a variety of tools for teaching and assessment purposes.

David and Roy addressed two of their three competency goals, while Lily and Alexis addressed all three. These numbers and explanations considered, the study managed to develop the participants' digital skills and addressed some of their personal challenges through these competencies as well.

During the final reflection (FI7), the participants were asked to indicate whether the CoP influenced the development of their *Digital Learning Competencies*. Roy felt that there was no real influence, while Lily and Alexis indicated that the community had a significant role to play in the development of their competencies. *("So, it was definitely inspiring to hear what they did, and it motivated me to do better."). (Lily – FI7).*

4.4 Elements of lesson design

4.4.1 Participants' preliminary elements of good lesson design

Before officially introducing the participants to the *DDD* framework and observation sheet, the researcher explored participants' impressions of good lesson design. Lesson design, however, was an unfamiliar term to the participants. *("For us it is a really difficult question – that lesson design, because we are IEB teachers. We kind of moved away from that (laughs loudly). We do not really think about those things, so I do not think any of us know what lesson design is… (laughs loudly)."). (David – FI1).* Despite the unfamiliarity of elements of lesson design, the participants identified some of the core elements of *DDD* as presented in Table 4-2.

Table 4-2. Participants' preliminary elements of lesson design

Participant	Elements of lesson	Element of *DDD*
David, Alexis, and Lily	Interactivity / collaboration	LA (Learning Activities)
David	Self-discovery	
Roy	Learning styles	
David	Teacher as learner	RO (Social Relations)
Alexis	Communication / feedback	AS (Assessment)
Lily	Feedback	
David	Engagement and learning through tools	TAB (Web-enabled Technologies)

Other elements provided by participants are illustrated in Figure 4-7.

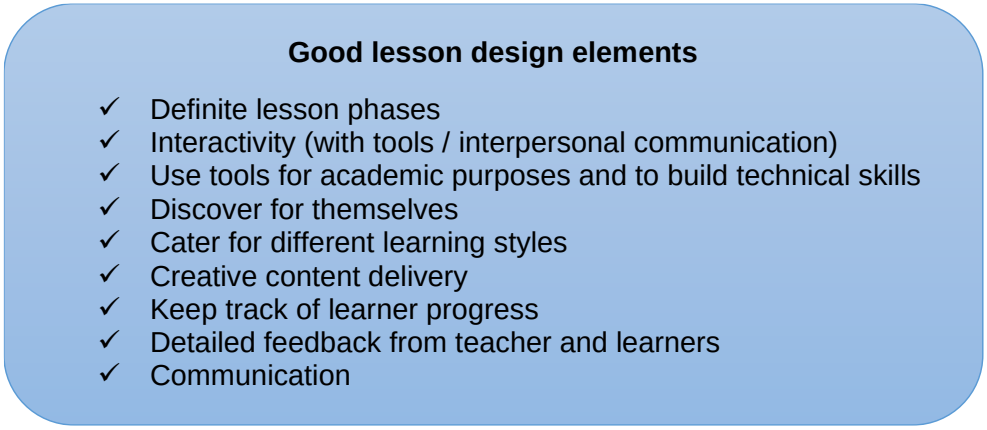


Figure 4-7. Participants' elements of good lesson design

David and Roy suggested definite lesson phases as learnt during teacher training (i.e. engaging lesson introduction; cover the content with a video as suggested by Roy; consolidation and/or assessment). Interactivity, engagement, and conversation (with or without tools) were referred to by most of the participants. Yet, the participants interpreted and applied interactivity in different ways in their teaching. David preferred to stimulate interactivity through device use, while both David and Alexis actively involved learners in conversation. For Alexis, feedback from learners through facial expressions and body language was important. Lily provided teacher feedback on assignments and monitored learners' progress and engagement via *Insights* on MS Teams.

In terms of device usage, David prioritised the academic use of tablets (i.e. not for games), while Lily indicated the need to equip learners with technical skills for the workplace. Roy highlighted the ability of devices to cater for another type of learning style. *("I think that the technology helps to add another sort of aspect of trying to get learners to learn in a different way. I do not know if all the learners learn in that way, though."). (FI1).*

David indicated that teachers could also assume the role of learners, since even he/she could always learn something. *("The teacher can also learn something new… 'But I would like to learn from you as well, so bring back to me as well.' Do not just take, but also give."). (FI1).*

4.4.2 Participant introduction to *DDD* (first impressions)

During FI2, participants were introduced to the elements of the *DDD* framework and its observation sheet. The participants reflected on the relevance to and practical possibility of incorporating these elements in their teaching context. Every participant's application of every element is summarised under *Introduction to DDD* in Table 4-3 to Table 4-6.

According to the *DDD* observation sheet, an ideal lesson's **TG / ILOs** are communicated to learners on a source and include teacher and learner goals while aimed at the development of learners' skillsets (Jahnke et al., 2017). For online lessons' goals, Lily stated that she gave less of a motivation for *why* the lesson goals were important, while she would have provided an in-depth motivation in face-to-face class settings (FI2).

The *DDD* observation sheet distinguishes between surface and deep learning in the **LA,** since deep learning is less dependent on textbook-teaching (Jahnke et al., 2017). However, the participants indicated that textbooks still played a leading role in their teaching. Fortunately, some of the textbooks (e.g. English according to David) are already written in a collaborative way. All the participants indicated that the use of textbooks was dependent on the lessons at hand, since the lesson content would determine the teaching strategies and learning activities. Roy's example clearly indicated the distinction between poetry and language lessons in the English classroom. *("It depends on what specific subject you're dealing with in that specific week. If we are dealing with a film study, then obviously we watch films; we look at videos on YouTube; we will go through theory; do lessons where they go outside and take photos of the various camera angles and stuff like that. But if I am doing a language lesson then it is more level one: It is more textbook learning with the use of maybe a PowerPoint or use of their textbooks to do exercises and stuff like that, so it's not as… it does not lend itself to being as interactive maybe."). (FI2).* Alexis supported Roy's description with a description of the difference between a language and poetry lesson. *("Some lessons, for me, you have to do word for word from the textbook like if we do rules for sentence structure. But if we do poems, or if we discuss a comprehension, then you engage with your class more - Hear their ideas; what is their opinion?"). (FI2).* In response to this, Lily stated that she and the others could aim to include all the elements of *DDD* in one carefully planned lesson, but that an

observation of a series of lessons is preferable. *("I think that they would get a better idea of what you actually do if they observe a whole week's worth of work or two weeks."). (FI2).* Since participants' levels of surface and deep learning ought not to be based on a single lesson observation, they shared several lessons with the observers to showcase the lesson series.

On the *DDD* observation sheet, the most outstanding feature of **ASM** is its continuous nature, while learner reflection is also essential (Jahnke et al., 2017). All participants agreed that in both Afrikaans and English lessons, the process-based writing approach included continuous feedback actions. Peer feedback was also often used by the participants. Roy explained the process that involved some peer editing as well: *"We work in class; we have peer-editing; we have editing online; I have interactive editing where people can send me things and ask my opinion on it." (FI2).* Learner reflection could be included as suggested by Roy: *"We can even have an extra five marks at the end where we ask them to fix things and we ask them to show that they have actually learnt something from the actual marking of it." (FI2).* David incorporated peer-feedback and reflection when learners peer-reviewed essays based on pre-set questions.

In *DDD*, both teachers and learners are encouraged to adopt multiple roles in **RO**. Teachers ought to adopt various roles while supporting a variety of learner roles and reflection on these roles (Jahnke et al., 2017). While Alexis let learners prepare lesson material to explain to the class, Roy encouraged his learners do their own research to share with the class.

Digital tool use in *DDD* is expressed by the four levels of the *SAMR* model in **TAB**. Participants' *SAMR* levels at the start of and during the study are indicated in Table 4-3 to Table 4-6.

4.5 Presenting and observing lessons

The study participants presented two lessons, one lesson per CAR cycle. A comparative summary of participants' classroom practices based on the elements of *DDD* at the start of the study, as well as for lessons 1 and 2 is provided per participant in Table 4-3 to Table 4-6. This not only includes the five elements of *DDD*, but also indicates aspects including surface and deep learning, constructive alignment,

participants' level of technology use, CoP inputs provided for lesson planning, as well as changes implemented by participants from lesson 1 to 2.

Table 4-3. Study overview: David's digital didactical designs

David			
Element of *DDD*	**Introduction to *DDD***	**Lesson 1:** English Grade 8 – Slam poetry (Two lessons)	**Lesson 2:** English Grade 8 – Literature: *Spud* (Two lessons)
TG/ILOs	Provided on first slide	**Planning** • Activity brief and activity provided via MS Teams. • Analysed a slam poem using a MS Word activity to collaborate (groups). **Method of planning presentation** Screen sharing of activity prompt	**Planning** • Activity brief provided via MS Teams. • Created a digital story using MS PowerPoint (Individual). **Method of planning presentation** Small notebook
		Observation • Interactive activity brief with URLs available via MS Teams • Groups of learners collaborated via OneDrive and MS Teams' chat function to complete a worksheet on a slam poem. • Every group member had to complete his / her assigned part.	**Observation** The group had to choose a scene from *Spud* and retell it as a digital animation using MS PowerPoint.
LA	Use of textbooks and online sources. Collaboration: Groups completed a document to study a poem (flipped classroom).	**Planning** Flipped classroom activity: • Learners watched two videos at home via URLs. • Group completed the activity online to analyse the poem. • Reflection activity • Submitted activity online via a link. • Analysed the poem as a class.	**Planning** • Watched a video beforehand via a link. • Created a digital story using MS PowerPoint in class: Included movement, dialogue, and voice recordings. • Teacher showed learners how to include elements in MS PowerPoint.
		Observation **Learner activities** • Collaborated via OneDrive and MS Word. • Used the MS Teams chat function to complete the document. **Teacher activities** • Engaged with learners in class and online.	**Observation** **Learner activities** • Watched two how-to videos. • Designed group animation videos in MS PowerPoint. **Teacher activities** Teaching strategies: Active and discovery learning as well as flipped classroom

		• Encouraged student collaboration. • Monitored online discussions. • Assisted with technical issues when prompted. • Verbally explained concepts when prompted.	
Surface/deep learning	N/A	Between collaborative surface and deep learning	Collaborative deep learning
ASM	Turnitin writing and peer assessment	**Planning** Learners submitted completed document and reflection to teacher (online).	**Planning** • Uploaded videos to MS Assignments. • Marked according to a 100-point rubric. • Possibility of peer assessment
		Observation • Learners submitted their documents to the teacher afterwards. • No formal assessment took place.	**Observation** • Group peer-assessment via MS Forms • Online teacher assessment via an MS Teams rubric • Focusing on quality and clarity of the video
Constructive alignment	N/A	Well-aligned	Well-aligned
RO	Teachers as learners	**Planning** Learners analysed the poem, collaborated while doing it and then reflected on this afterwards.	**Planning** Learners as designers, peer-teachers during collaboration and experts (due to videos watched)
		Observation Mostly learner-learner interaction with some teacher-learner interaction **Teacher roles** Coach and learning companion **Learner roles** Collaborators, producers, and reflectors	**Observation** **Teacher roles** Facilitator, process-mentor, and coach: • Designed activity prompt and MS PowerPoint template. • Provided formative technical assistance. • Guided the peer-assessment process. **Learner roles** Content producers, collaborators, and critical reflectors: • Active lesson preparation (watched videos) • Designed animated MS PowerPoint videos in groups. • Completed peer assessment. • Collaborated to design end-product.

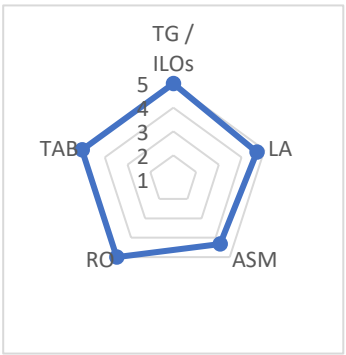
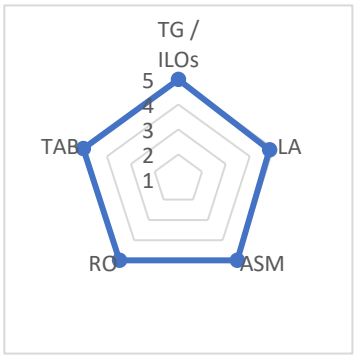
<table>
<tr><td rowspan="2">TAB</td><td rowspan="2">SAMR level
Modification
Tools used
OneDocument, OneNote, MS Word, PowerPoint, and Teams
Purpose
“Discover for themselves using their devices.” (FI3)
Collaboration, organisation of learning and online learning</td><td>Planning
The activity prompt guided learners to share the document via email to collaborate in one document
Purpose
Access to lesson content and online collaboration</td><td>Planning
Learners use PowerPoint individually.</td></tr>
<tr><td>Observation
SAMR level: Redefinition
Tools used and purpose:
Activity prompt via MS Teams
MS Teams, MS Word and OneDrive for learner collaboration
Google for information searches
Flipped classroom using online links (YouTube)
Teacher and learners in a variety of roles</td><td>Observation
SAMR level: Redefinition
Tools used and purpose:
Activity prompt via MS Teams
YouTube video links as URLs in the activity prompt
MS PowerPoint for video-making and a digital story PowerPoint template
MS Teams chat, OneDrive and email addresses for learner collaboration
MS Forms for peer and teacher assessment</td></tr>
<tr><td rowspan="2">CoP inputs</td><td rowspan="2">N/A</td><td>Planning
Peer feedback
(“I actually think David’s lesson is very well prepared.”). (Lily - FI3)</td><td>Planning
Researcher feedback
Include formative peer feedback.
David intended to use the teacher’s rubric for peer-assessment.
Peer ideas
Alexis: Use MS PowerPoint to create videos</td></tr>
<tr><td>Observation
Changes implemented
No changes were made to the original lesson design before presentation</td><td>Observation
Changes implemented
Online peer assessment via MS Forms included
MS PowerPoint template was used.</td></tr>
<tr><td>DDD</td><td>N/A</td><td>Cluster A
 
</td><td>Cluster A
 
</td></tr>
<tr><td>Changes implemented from lesson 1 to 2</td><td>N/A</td><td>Reflection (FI4E)
No formal, online assessment</td><td>Changes
Formal, online assessment</td></tr>
</table>

Table 4-4. Study overview: Roy's digital didactical designs

<table>
<tr><th colspan="4">Roy</th></tr>
<tr><td>Element of DDD</td><td>Introduction to DDD</td><td>Lesson 1:
Planning
English Grade 7 / 10 – Novel / Poetry lessons
("At the moment we're doing a lot of novel work and so it's reading at the moment and it's not the best time to actually do stuff with the… So, I am trying to find time in between things to actually do poetry and that kind of stuff as well."). (FI3).
Observation
English Grade 10- Language (One lesson)</td><td>Lesson 2: English Grade 10 - Poetry: Songs (Two lessons)</td></tr>
<tr><td rowspan="2">TG/ILOs</td><td rowspan="2">Presented orally</td><td>Planning
No indication of what the outcome was or how it would be communicated.
Method of planning presentation
Oral sharing of ideas</td><td>Planning
Activity brief via MS Teams
Researched songs and made narrated MS PowerPoints for peer and teacher assessment (groups)
Method of planning presentation
Oral sharing of ideas</td></tr>
<tr><td>Observation
Presented orally and written on the board while explaining.
("By the end of today, you should know in your mind which one is which (i.e. simple compound and complex sentences).").
(OBS1 Roy R).</td><td>Observation
Activity prompt shared via MS Teams and with screen-sharing during class. Explained orally as well.
("In this assignment, you will be asked to select and analyse a song in a group setting. You will need to collaborate in this assignment by the use of a variety of programs and applications."). (CAR 2 Roy D1).
Learners designed narrated MS PowerPoints in groups</td></tr>
<tr><td rowspan="2">LA</td><td rowspan="2">Dependent on type of lesson
Films: Interactive
Language: Teacher-centred</td><td>Planning
Individual work rather than group work due to social distancing
Interactivity</td><td>Planning
In groups of 3, learners researched songs</td></tr>
<tr><td>Observation
Learner activities
Participated in teacher's explanation (answered oral question, analysed sentences with the teacher and wrote down example sentences).</td><td>Observation
Learner activities
Collaborate online to gather information.
Design narrated MS PowerPoints.
Active and discovery learning as well as flipped classroom</td></tr>
</table>

		• No activities are completed afterwards. **Teacher activities** • Explained concepts on the whiteboard using real-life sentence examples. • Gauge learners' level of understanding.	**Teacher activities** • Designed and explained the activity prompt. • Technical assistance while learners design • Manage and guide the peer-assessment process.
Surface / deep learning	N/A	Individualised deep learning	Collaborative deep learning
ASM	Process writing	**Planning** Not indicated	**Planning** Three random peer assessors per group via MS Notes
		Observation • No activity completed • Teacher provided feedback on learners' questions / answers based on his explanations. • Only learners in class contributed.	**Observation** • Group peer-assessment via MS OneNote • Teacher assessment with an MS Teams rubric, focusing on the oral and presentation aspects
Constructive alignment	N/A	Average alignment	Well-aligned
RO	Find own information and make presentations / posters.	**Planning** Possibly collaborators	**Planning** Learners as researchers and collaborators
		Observation Mostly learner-learner interaction with some teacher-learner interaction **Teacher roles** Expert and coach **Learner roles** Information receivers and answering teacher questions	**Observation** **Teacher roles** • Process mentor, technical assistant, coach, and facilitator • Designed and explained the activity prompt. • Provided group assistance. • Guided and monitored the peer-assessment process. **Learner roles** • Collaborators, orators, designers, and information finders • Assessors
TAB	**SAMR level** Between Substitution and Augmentation **Tools used** Flipgrid **Purpose** • Access to online platforms,	**Planning** Access to collaborative spaces, but unsure what would work for grade 7s	**Planning** Group collaboration via Flipgrid / other platform and MS Word
		Observation **SAMR level:** Substitution **Tools used and purpose:** • MS Teams for online teaching • Whiteboard for explanations	**Observation** **SAMR level:** Redefinition **Tools used and purpose:** • Online group division tool: www.wheeldecide.com • MS Teams chat function; MS Word / PowerPoint; Flipgrid and/or other video platforms

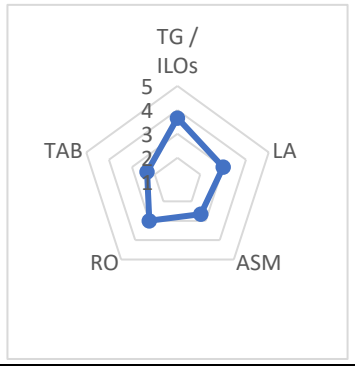
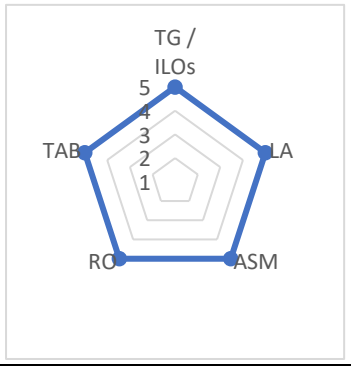
	but prefer paper-based • Organisation of learning and online learning	• No interaction with online learners and teacher as expert (no collaboration)	like YouTube, music apps, websites, animations, and pictures to create videos
CoP inputs	N/A	**Planning** **Researcher feedback** Guidance on possible lessons since current lesson material was not suitable for technology-based lesson. **Ideas from peer lessons** Roy saw the use of collaborative spaces in David's lesson that he also presented.	**Planning** No feedback, but the researcher is very impressed with the detailed planning and type of lesson.
		Observation **Changes implemented** • Language lesson (not Prose / Poetry) • No changes were made to include technology in the lesson.	**Observation** **Changes implemented** No changes were made to the original design.
DDD	N/A	**Cluster C** 	**Cluster A** 
Changes implemented from lesson 1 to 2	N/A	**Reflection (FI4E)** • Uncertainty during planning (FI3) • Strong content coverage (learners less active) • Teacher-centred ('Chalk-and-talk') • Very limited peer interaction • Limited technology use	**Changes** • Clear plans • Active learning • Highly learner-centred • Collaboration • High-level technology use

Table 4-5. Study overview: Lily's digital didactical designs

<table>
<tr><th colspan="4">Lily</th></tr>
<tr><th>Element of DDD</th><th>Introduction to DDD</th><th>Lesson 1: Afrikaans Grade 9 – Novel revision (Two lessons)</th><th>Lesson 2: Afrikaans Grade 9 – Film study (Die Pro) (Lesson series)</th></tr>
<tr><td rowspan="2">TG/ILOs</td><td rowspan="2">Presented on a poster
Provide a 'Week ahead' schedule (online)</td><td>Planning
Activity brief provided via MS Teams.
("The whole point of this is to revise our book that we have been doing."). (FI3).
Lesson planning form
Method of planning presentation
Screen sharing of activity prompt</td><td>Planning
Activity brief provided via MS Teams.
Designed Powtoon videos with a summary, highlights, lowlights, opinion, and score of the film (individual).
Method of planning presentation
Screen sharing of activity prompt</td></tr>
<tr><td>Observation
Activity brief via MS Teams and discussed orally.
YouTube video to explain Flipgrid use.
MS Insights: Activity prompt viewed 59 times
Groups summarised assigned chapters from their novel by making a video on Flipgrid.
Test on novel content</td><td>Observation
Activity brief via MS Teams and displayed on the whiteboard.
Learners wrote individual film reviews on Die Pro by making a Powtoon video.
Online peer-assessment (rubric available at the start)</td></tr>
<tr><td rowspan="2">LA</td><td rowspan="2">Dependent on type of lesson
Process: Textbook teaching > Discussion > Assessment</td><td>Planning
Flipped classroom
Watch a Flipgrid tutorial
Groups summarised chapters from the prescribed novel and created Flipgrid videos.</td><td>Planning
Preparation: Film study notes
Learners did Powtoon book reports (in class and at home).
Powtoon tutorials via weblinks watched in class.
Teacher recommends Powtoon book report template.</td></tr>
<tr><td>Observation
Learner activities
Watched a Flipgrid tutorial.
Summarised chapters from the novel in groups.
Designed a Flipgrid video as summary.
Wrote a test on the novel's content.
Teacher activities
Designed activity prompt.
Included how-to videos on activity prompt.
Displayed learners' videos to the class.</td><td>Observation
Learner activities
Watched YouTube tutorials about Powtoon design.
Designed individual, creative Powtoons that included the plot, three or more highlights and low points from the film, a general opinion of the film and a score out of five.
Teacher activities
Designed, explained, and presented activity prompt and rubrics.</td></tr>
</table>

		• Setup and managed multiple-choice test on MS Teams	• Recommended *Powtoon* template. • Chose YouTube tutorial videos. • Employed discovery learning and active learning strategies.
Surface / deep learning	N/A	Collaborative deep learning	Collaborative deep learning
ASM	Older grades: Process-based writing of essays with formative feedback	**Planning** • Class looked at all group videos to revise the novel's content (Videos not assessed) • Assessment on MS Teams (30 multiple choice questions)	**Planning** • *Powtoon* videos were submitted via MS Teams / email. • Online peer-assessment with 20-mark rubric (topic, language use, organisation)
		Observation Learners watched all groups' videos in preparation of a 30 mark online multiple-choice test.	**Observation** • Online peer and teacher assessment based on a rubric. • Focus: Level of content delivery, language use, and technical skillsets of designing *Powtoons*
Constructive alignment	N/A	Well-aligned	Well-aligned
RO	Communication / feedback from learners	**Planning** • Learners as designers and judges • Teacher as facilitator	**Planning** • Learners as designers and judges • Teacher as facilitator
		Observation Learner-to-learner and teacher-to-learner communication **Teacher** Process-mentor and coach **Learners** • Content-producers, collaborators, and reflectors • Learners changed roles to become peer-teachers	**Observation** **Teacher** Expert, learning mentor, facilitator, process mentor, and coach **Learners** Content producers, collaborators, and critical reflectors
TAB	**SAMR level** From Substitution to Augmentation due to Covid-19 **Tools used** MS PowerPoint videos, Flipgrid and collaboration tools **Purpose**	**Planning** • Activity prompt via MS Teams • YouTube tutorial about Flipgrid • Learners used Flipgrid to make videos that summarised their novel chapters.	**Planning** • Participant had not used *Powtoon* before • Learners created individual *Powtoons*
		Observation **SAMR level:** Modification **Tools used and purpose:**	**Observation** **SAMR level:** Modification to redefinition

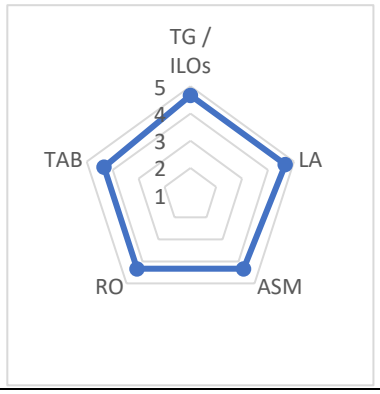
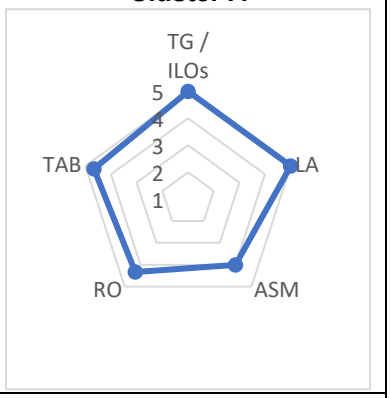
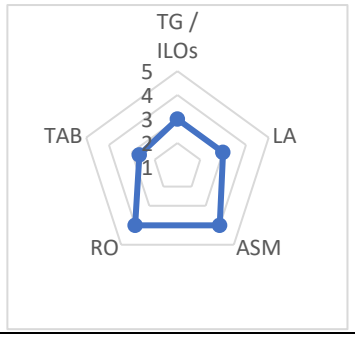
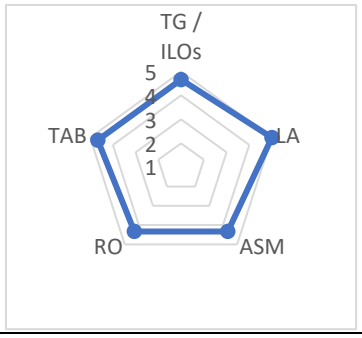
	• PDF substitutes paper (S) • Apps for online assessment and MS Teams quiz (A) • Collaboration and organisation of learning and online learning	• MS Teams for activity prompt • Flipgrid to design videos • MS Forms for multiple-choice test • YouTube videos explaining the use of Flipgrid	**Tools used and purpose:** • *Powtoon* and *Powtoon* template to create own videos • YouTube tutorial videos on designing *Powtoon* videos • MS Teams for activity prompt and online assessment
CoP inputs	N/A	**Planning** **Peer feedback** David: Use webcam to film the lesson; how to setup a Flipgrid	**Planning** **Researcher feedback** Suggestion for online marking (Lily planned on doing this) **Peer feedback** Alexis: Peer assessment to enable collaboration
		Observation • Lily used her smartphone camera for the recordings. • David assisted Lily with the setup of the Flipgrid.	**Observation** • Online marking using a rubric • Peer-assessment using the same online rubric
DDD	N/A	**Cluster A** 	**Cluster A** 
Changes implemented from lesson 1 to 2	N/A	**Reflection (FI4A)** • Flipgrid videos were not assessed. • Lower LA score because of a lack of teacher feedback in class (activity completed at home)	**Changes** • Formal assessment of learners' *Powtoon* videos (Teacher and peer-assessment) • Online marking • Learners had time to plan in class under her guidance (not filmed).

Table 4-6. Study overview: Alexis' digital didactical designs

Alexis			
Element of *DDD*	**Introduction to *DDD***	**Lesson 1:** Afrikaans Grade 7 – Novel revision (Two lessons)	**Lesson 2:** Afrikaans Grade 8 – Prepared speech (Lesson series)
TG/ILOs	• Presented on a poster in class. • Not done online	**Planning** • Studied chapter 1 – 10 of their novel. • Other ideas: Groups acted out book section in video recordings. • Provided learners with question examples (PDF). **Method of planning presentation** Oral sharing of ideas	**Planning** • Unclear how the outcome was communicated. • Learners recorded videos of recipe making in groups by combining video segments. **Method of planning presentation** Oral sharing of ideas
		Observation • Oral communication of TG • Learners revised their language structures at home. • Learners designed quiz questions on the studied language rules. • Teacher designed a quiz on the rules incorporating learners' questions.	**Observation** • TG presented orally and via teacher's MS PowerPoint (not available on MS Teams) • Learners made an MS PowerPoint video of their prepared speech where each group member demonstrated a part of the Afrikaans recipe. • Peer assessment was done afterwards.
LA	Dependent on type of lesson • Literature: Engagement • Language: Teacher-centred	**Planning** Book sections were re-read in class.	**Planning** • In groups, every member recorded a part of making a recipe. The parts were then combined into one video using an app. • MS PowerPoint allowed for creativity in video design. • No group work in class due to social distancing (rather remote collaboration)
		Observation **Learner activities** • Revised language structure rules at home. • Designed quiz questions on language rules. • Wrote the quiz on MS Teams. **Teacher activities** • Flipped classroom • Provided activity brief. • Corrected learners' questions before entering them into the quiz. • Designed multiple-choice quiz on MS Teams.	**Observation** **Learner activities** • Divided themselves into groups of 3 – 5. • Every group member recorded their performance of doing a part of a recipe. • Combined video segments. **Teacher activities:** • Active learning and the Jigsaw method • Explained the assignment. • Teacher guidance on video design • Guided the peer-assessment process.

		• Provided feedback on the quiz answers.	
Surface / deep learning	N/A	Individual deep learning	Collaborative deep learning
ASM	Peer assessment of weekly spelling tests	**Planning** Quiz on *Kahoot!* (uncertainty) or MS Teams (knows how to use)	**Planning** • Online group peer assessment (uncertainty about marking platform) • Focus on success of group work and the final video's quality
		Observation • Learners wrote the quiz on MS Teams. • Discussion of quiz answers	**Observation** MS Forms: Peer-assessment (and teacher moderated)
Constructive alignment	N/A	Average alignment	Well-aligned
RO	Learners studied a page; explained the contents to the class and then completed the activity with the teacher's assistance.	**Planning** • Learners as presenters • Teacher's role: Unspecified	**Planning** • Learners as presenters • Teacher's role: Unspecified
		Observation **Teacher** Expert, process mentor, and coach **Learners** Producers and collaborators, consumers, peer-teachers, and creators of own learning paths	**Observation** **Teacher** Expert, facilitator, process-mentor, and learning companion **Learners** Collaborators, designers, evaluators, reflectors, and peer-teachers
TAB	**SAMR level** From Substitution to Augmentation due to Covid-19 **Purpose:** • PDF substitutes paper (S) • Working online; saving paper (A) • Collaboration, organisation of learning, and online learning	**Planning** Learners did a quiz on Kahoot or MS Teams	**Planning** Learners created their own narrated MS PowerPoints
		Observation **SAMR level:** Augmentation **Tools used and purpose:** • MS Teams quiz to design and complete online test. • MS Teams for online lesson presentation	**Observation** **SAMR level:** Redefinition **Tools used and purpose:** • MS PowerPoint with activity prompt • MS PowerPoint for learner video creation • MS Forms for peer-assessment • Different apps to combine learner videos
CoP inputs	N/A	**Planning** *("So, I am actually looking for ideas to incorporate level 3 and 4 because I feel like my*	**Planning** **Researcher feedback** • Learners use other apps to combine video parts.

		lesson is very level 1 and 2."). (FI3). **Researcher feedback** Learners design their own revision question on MS Teams (Alexis was scared that language and word-order will be a mess) or in MS Word with one-word answers. **Peer feedback** Lily: Use the idea for older, more technically skilled grade 8s.	• Online assessment: Use Google Forms **Peer assistance / feedback** • David: Combine videos using PowerPoint • David: Template for online peer assessment (shared with Alexis and Lily)
		Observation • Learners designed their own test questions (more complex cognitive activity) • Lesson for grade 7s	**Observation** • Learners could use any apps to combine videos. • MS Forms used for online peer-assessment. • David's assessment template was modified and used.
DDD	N/A	**Cluster B** 	**Cluster A** 
Changes implemented from lesson 1 to 2		**Reflection (FI4A)** • New digital tools must be used • Individual tasks • No peer assessment • Maintain a teach-talk interaction pattern	**Changes** • Use a limited number of familiar tools in new ways (i.e. PowerPoint) • Use current practice activities in new ways. "Keeping in mind that from the previous lesson that less is actually more, I was thinking about incorporating something I do every day with the kids (or every term or every year rather.") (FI5) • Group task • Online peer assessment • Learners help to design the rubric criteria (i.e. learner-input)

4.6 Lesson 1: Presentation, observation, and reflection (CAR cycle 1)

The overview of participants' digital didactical designs provided in 4.5 provides details that are not repeated in the discussion of participants' lesson designs here.

Due to the COVID-19 pandemic, all participants had to teach both face-to-face and in an online mode via MS Teams. The lesson observations were done by accessing recorded lessons via MS Stream (for the participants) and MS OneDrive (for the researcher). The OneDrive content folder also included activity prompts, proof of learners' work, and observation sheets. The observation schedule for both CAR lessons is supplied in Table 4-7.

Table 4-7. Observation schedule for CAR lessons

Observer	Lesson designer and presenter			
	David	**Roy**	**Lily**	**Alexis**
Self	David	Roy	Lily	Alexis
Peer	Roy	David	Alexis	Lily
Researcher	Researcher	Researcher	Researcher	Researcher

The results of every participant's three observation sheets were combined to create a detailed picture of each participant's digital didactical design. These results aimed to depict every participant's digital didactical design, the design's constructive alignment, and the level of surface/deep learning that occurred.

A visual overview of every observer's interpretation of the participant's digital didactical design is presented as four radar charts. On the charts, level 1 is located at the centre of the chart, while levels 2 to 5 are each plotted on a line, starting from the smallest pentagon at the centre of the chart. In general, the self-observer awarded lower scores than the other observers.

According to Wiggins and McTighe (2005), the three key elements of good design are the outcomes, the teaching, and the assessment. To determine the constructive alignment among these three elements, the researcher had to carefully scrutinise the observation sheets. In *DDD*, constructive alignment refers to an alignment of all the elements as stated by Wiggins and McTighe (2005), with an additional interest in how social roles and digital tools work towards the common goal. The alignment of scores on the radar charts depicting participant's digital didactical designs illustrated the lesson design's constructive alignment.

The analysis of surface and deep learning can be based on the lesson design's outcomes, resources used, questions asked, and assessment done as suggested by Wilson Smith and Colby (2007). Such an analysis was enabled by the coding scheme in Figure 3-8.

4.6.1 David's first lesson

4.6.1.1 David's digital didactical design

In Table 4-8, four radar charts of David's digital didactical design (i.e. one per observer as well as an average) are included. The self-observation chart contrasted with the other charts with not as many level 5 elements. David's digital didactical design scored 3 and above. With an average design of above 4, his design was classified as cluster A as defined by Jahnke et al. (2017) in Table 2-1.

Table 4-8. David's *DDD* radar charts for lesson 1

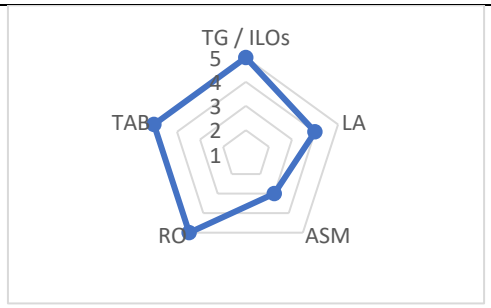
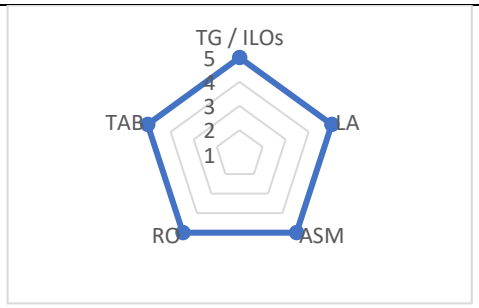
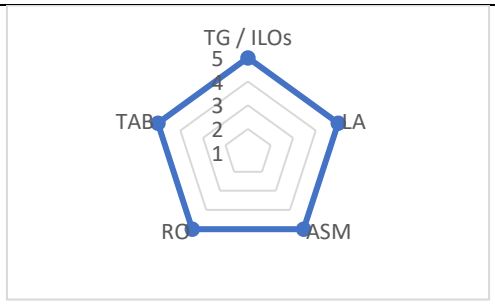
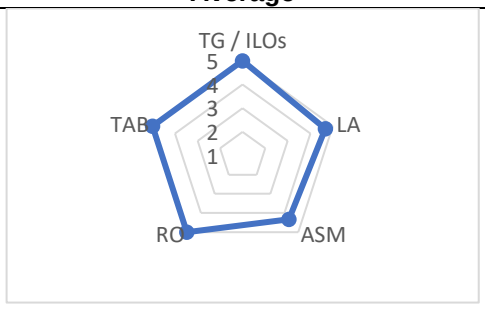
Self-observation	Peer-observation
	
Researcher observation	**Average**
	

Table 4-9 provides a summary of the scores for the *DDD* elements of the three observers during the observations. It also provides changed scores based on the lesson reflections during FI4E. During the observation of this lesson, the self-observer, peer-observer, and the researcher's scores differed for three of the elements, marked in blue (i.e. LA, ASM and RO). No scores were changed during the reflection phase.

Table 4-9. *DDD* observation scores for David's lesson on the observation sheet and after reflection

***DDD* elements**	**Self**	**Peer**	**Researcher**	**Average**
TG/ILOs	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
LA	**Observation** 4	**Observation** 5	**Observation** 5	**Observation** 4,7
	Reflection 4	**Reflection** 5	**Reflection** 5	**Reflection** 4,7
ASM	**Observation** 3	**Observation** 5	**Observation** 5	**Observation** 4,3
	Reflection 3	**Reflection** 5	**Reflection** 5	**Reflection** 4,3
RO	**Observation** 4	**Observation** 5	**Observation** 5	**Observation** 4,7
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
TAB	**Observation** 4	**Observation** 5	**Observation** 5	**Observation** 4,7
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5

The **TG/ILO** and its manner of presentation is summarised in Table 4-3. The outcome was aimed at both collaboration and knowledge construction whereby learners' knowledge and skills were developed. During the reflection phase, Roy referred to the difference in content-driven or skills-driven teaching and the value of learners' skill gains*. ("They will forget the content at some point, but they will not forget the skills that they have actually gained."). (FI4E).* He also indicated that David's lesson equipped learners with workplace skills. *("You are making them (forcing them) to do things in a different way, which is maybe something that they're going to have to do in the future."). (FI4E).* David reflected that learners enjoyed the relevant topic and the use of technology during the lesson. *("I do know that they enjoyed the poem because it's quite a modern poem; one that they could relate to as well."). (FI4E).*

The lesson's **LA**, expressed as learner and teacher activities, is summarised in Table 4-3. The LA involved internet-based research and online discussions to ensure that every group member completed one part of the lesson (OBS1 S). This displayed a learner-centred approach as learners evaluated and created their own interpretations of the poem, based on their research and collaboration. David's learners were already familiar with the learner-centred flipped classroom approach and this benefitted the

lesson flow. *("The kids know the structure quite well on how to do the flipped classroom because I have done it a few times before, so they could do it."). (FI4E).* According to Roy, when such active learning replaces passive knowledge transmission, learners' learning gains are so much higher. *("…Trying to find out the information yourself and then retain information is better than having one person stand up and tell you what the information is and then trying to remember that."). (FI4E).* On the other hand, David did not find his lesson entirely collaborative owing to Wi-Fi issues that prevented effective online collaboration for all learners, and this led to a 4 for his self-observed LA. *("I felt, because of the Wi-Fi issues and things that just did not work as they were supposed to, it definitely was not a 5 for me."). (FI4E).*

The **ASM** for this lesson, including the type of assessment and the assessors, is summarised in Table 4-3. The researcher noted learners' electronic documenting of their learning, their discovery of lesson content, and some reflective learning through a group feedback form. While the learners submitted their work to the teacher, no formative feedback was provided on the document. Instead, David provided technical and content assistance when prompted. According to David, ASM was the lesson's weakest element, because he felt that his feedback was insufficient. *("I felt that I only responded when I was asked."). (FI4E).*

The **RO** for this lesson is contained in Table 4-3. Learners' need for technical assistance to access OneDrive caused some time spent on bringing everyone on board*. ("It takes a while for students to be instructed and (get) onboard with the task."). (Roy - FI4E).* Once this was done, the lesson went mostly smoothly (except for Wi-Fi issues). Learners who were in class, however, were challenged in their discussions due to social distancing. For this reason, David relied on the online chat function on MS Teams. David gave himself a lower score than the peer-observer and researcher because he considered social relations regardless of the technologies used. *("I kind of looked at them without technology or thinking technology should not be the centre of it."). (FI4).* Roy indicated that David succeeded in transferring the responsibility for learning to learners, implying that the teacher's role changed to that of learning facilitator. *("I think if you look at modern-day teaching, it is making the kids responsible for the lesson and you being the facilitator."). (FI4E).* David noted the usefulness of MS Teams to monitor learner activity and interaction, a key element noticed by the researcher as well. Roy only indicated that the learners had to work in groups and

observed a successful working relationship among learners in the class and online. *("There was a good synergy between online learners and classroom learners."). (FI4E).*

David's SAMR level and tools used are included under **TAB** in Table 4-3. David indicated that his self-observation score was based on his wide variety of tools as well as his use of a variety of links to help learners build their own understanding. During the reflection, however, he also indicated that while outside observers perceived the lesson as highly successful, the Wi-Fi connectivity issues prevented some learners from effective online document access and collaboration. *("We did experience a lot of issues with Wi-Fi, where some children just could not see; they could not work on the live document."). (FI4E).* Roy agreed that technical issues restrained the success of such a collaborative lesson. *("If you are able to participate in the lesson, then it is effective; if you are unable to participate in the lesson because of the same technology then it becomes ineffective."). (FI4E).* Such technical issues were the grounding for a lower self-observation score by David as discussed during the reflection phase.

David's TAB ranged between 4 and 5 but closer to 5, therefore placed at a redefinition level of the *SAMR* model. David's design is placed between levels 4 and 5 of the levels of technology integration. At level 4 (i.e. *modification*), David's design included learners' own use of technology, choice of learning content, and online group organisation. At level 5 (i.e. *redefinition*), he presented a lesson inconceivable (especially during the COVID-19 pandemic) without the use digital tools.

4.6.1.2 David's constructive alignment

Table 4-10 answers three questions that analyse the alignment among lesson design elements.

Table 4-10. David's constructive alignment in lesson 1

To what extent was the outcome met?	How were ASM and TG linked?	How were LA and TG linked?
Learners managed to complete their part of the document using online tools (if they could connect to MS OneDrive and/or the Wi-Fi). The outcome was met very well.	The online submission of groups' completed documents served as proof of their successful online collaboration.	Learners could discover the poem for themselves and in groups by following the activity prompt and by collaborating online.

The lesson's outcome (TG/ILOs) was reached through online collaboration (RO and TAB), whereby the assessment (ASM) and teaching (LA) were relevant. All *DDD* elements scored 3 and higher on the observation sheets, therefore this lesson design was constructively well-aligned.

4.6.1.3 David's surface and deep learning analysis

Table 4-11. Analysis of David's surface and deep learning

Data sources	OBS1 David S, P and R; CAR1 David D1 and CAR1 David D2
Lesson element	**Analysis**
Outcomes (TG/ILOs)	**Verbs from Bloom's taxonomy** *Collaborated to analyse* a poem while *using* internet resources. Learners had to *reflect, summarise, select, justify, discuss,* and *interpret* while completing the poetry analysis activity collaboratively.
	Skills developed • Constructed own learning via URLs and collaboration. • Technical skills to collaborate online
Tablets (and other digital resources) (TAB)	**Manner of tool use** • Online collaboration and submission of work • Learners in class and online were involved through MS Teams and MS OneDrive. • Online sources assisted with the completion of the activity.
Learning activities (LA)	**Types of questions** The poetry analysis activity required learners to analyse a poem as prompted by a variety of higher-order questions as seen in the outcome.
Assessment (ASM)	**Measurement of surface/deep learning** Learners worked in groups to complete parts of the document. Analysis and evaluation occurred under the teacher's supervision.

Based on the elements of analysis in Table 4-11, David's lesson included effective collaborative learning involving application, analysis and evaluation (i.e. not create). Learners did not produce new materials and were not peer reflectors, therefore this lesson design was between collaborative surface and deep learning (Jahnke et al., 2014a).

4.6.2 Roy's first lesson

4.6.2.1 Roy's digital didactical design

Table 4-12 represents the four radar charts of Roy's digital didactical design. Since Roy's lesson included teacher-centred, textbook-driven teaching with little to no technology used, the different observers found it challenging to score his lesson. This variety in interpretations was explored during the reflection phase of CAR 1. The average design included mostly level 3 scores, while TG leaned towards 4 and TAB ranged between levels 1 and 2. Since Roy's design reflected high and low-level

scores, his digital didactical design ranged between clusters B and C, but mostly cluster C as defined by Jahnke et al. (2017) in Table 2-1.

Table 4-12. Roy's *DDD* radar charts for lesson 1

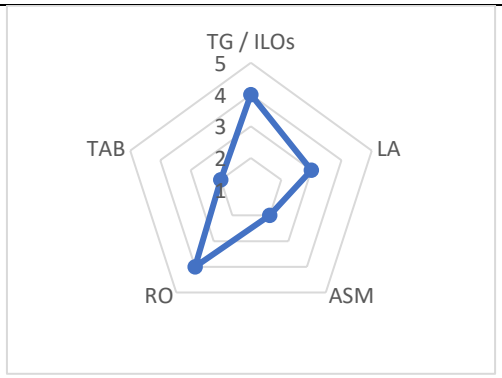
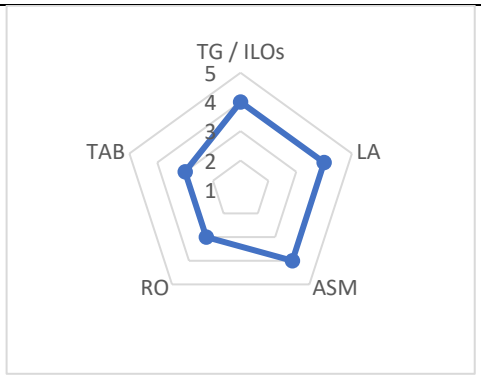
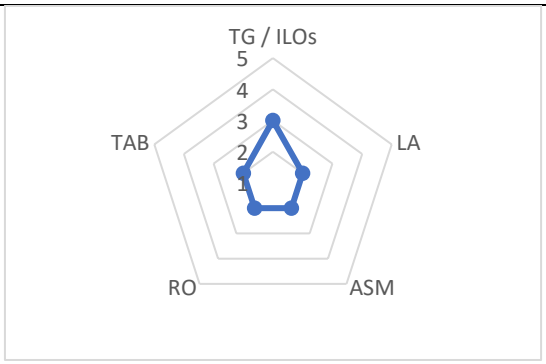
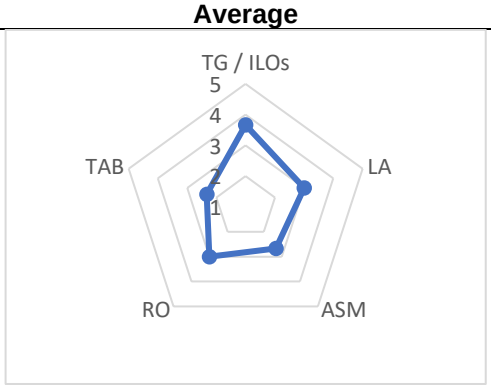
Self-observation	Peer-observation
	
Researcher observation	**Average**
	

Table 4-13 provides a summary of the scores for the DDD elements of the three observers during the observations and after the reflections (FI4E). During the observation of this lesson, the self-observer, peer-observer, and the researcher's scores differed for three of the elements, marked in blue (i.e. all elements). Scores that were changed during the reflection phase (FI4E) are marked in orange.

The **TG/ILO** and its manner of presentation is summarised in Table 4-4. Roy's lesson was focused on language structures and the skills to identify parts of sentences. For Roy, the content coverage was a strength during the lesson and David agreed. *("I could see that he knows his content quite well, which is great."). (David – FI4E).*

In terms of score differences for TG/ILOs, David awarded a 4 for the lesson's focus on skills development and the inclusion of learners' co-aims. From a strictly digital

perspective, however, Roy might have scored only a 3 since online learners were not actively involved by the teacher as observed by David and the researcher.

Table 4-13. *DDD* observation scores for Roy's lesson on the observation sheet and after reflection

***DDD* elements**	**Self**	**Peer**	**Researcher**	**Average**
TG / ILOs	**Observation** 4	**Observation** 4	**Observation** 3	**Observation** 3,7
	Reflection 4	**Reflection** 4	**Reflection** 3	**Reflection** 3,7
LA	**Observation** 3	**Observation** 4	**Observation** 2	**Observation** 3
	Reflection 3	**Reflection** 4	**Reflection** 2	**Reflection** 3
ASM	**Observation** 2	**Observation** 4	**Observation** 2	**Observation** 2,7
	Reflection 2	**Reflection** 4	**Reflection** 2	**Reflection** 2,7
RO	**Observation** 4	**Observation** 3	**Observation** 2	**Observation** 3
	Reflection 4	**Reflection** 3	**Reflection** 2	**Reflection** 3
TAB	**Observation** 2	**Observation** 1	**Observation** 3	**Observation** 1,7
	Reflection 2	**Reflection** 3	**Reflection** 2	**Reflection** 2,3

The lesson's **LA**, expressed as learner and teacher activities, is summarised in Table 4-4. According to David, Roy delivered content in both face-to-face and online environments. There was adequate teacher-learner interaction, observed by David and the researcher. The LA had big score discrepancies as seen in Table 4-13. The researcher missed learner-learner interaction. According to David, Roy's lesson had some of the level 5 descriptors, including learners' prompted thinking regarded as reflection, but the lack of technology disabled deep learning. Roy gave no clear indication of why he awarded a 3.

The **ASM** for this lesson, including the type of assessment and the assessors, is summarised in Table 4-4. In terms of ASM, Roy indicated that no assessment took place during this lesson, although this was planned for in future. This links in with Roy's earlier indication that all aspects of *DDD* cannot necessarily be dealt with in every lesson. David, however, indicated that Roy's questions and answers engaged learners and tested their knowledge. The researcher confirmed Roy and David's observations in her own descriptions.

Another score discrepancy occurred for ASM. David gave a 4 for learner questions and teacher feedback that evoked prior-knowledge, although he disregarded the use of technology for assessment purposes while scoring this element. Some elements of formative feedback were visible, but random in nature as observed by the researcher.

The **RO** for this lesson is contained in Table 4-4. Roy indicated that learner-interaction occurred with the purpose of establishing baseline knowledge and David observed Roy's engagement and gauging of the learning. *("He was engaging with the students, asking them direct questions"). (FI4E).* The researcher, however, observed that Roy only fulfilled the role of the expert who asked close-ended questions. With no score discrepancy, this element was not further explored during the reflection phase (FI4E).

Roy's *SAMR* level and tools used are included under **TAB** in Table 4-4. Although online leaning took place, Roy observed that the *"technology aspect (was) missing." (OBS1 Roy S)* and David agreed (FI4E). From a *DDD* perspective, David regarded the lack of technology as problematic. While Roy's online teaching via MS Teams included an element of technology, online learners were not involved, and had an obstructed view according to the researcher. Roy felt that screen-sharing would have been redundant to include learners at home and only a superficial way to increase his level of technology use (FI4E). According to him, learners' obstructed view was caused by a technical issue (short projector and power cable) beyond his control and MS Teams' whiteboard function which was not user-friendly without a 2-in-1 device either. Roy also did not want to be stuck behind his computer while explaining.

Three different scores were once again awarded for Roy's TAB. David initially gave a 1, but changed this to a 3 during the observation, because of the use of MS Teams to record the lesson. Roy explained his understanding of technology use in terms of learners' active engagement by means of the technology. *("You see, so my understanding was: if the kids are not actively engaged via technology (they have to type or respond or collect information), then I have to give a 1."). (FI4E).* Initially, the researcher scored a 3, but later realised that the streaming only enabled online learners to view the class, without being involved. This made her lower her TAB score.

On average, Roy's use of technology scored a 2, therefore at the *substitution* level of the *SAMR* model. Based on levels of technology integration, Roy's design was still at

an entry level (i.e. level 1) where technology was used to a very limited extent and for content-driven, traditional teaching.

4.6.2.2 Roy's constructive alignment

Table 4-14 answers three questions that analyse the alignment among lesson design elements.

Table 4-14. Roy's constructive alignment in lesson 1

To what extent was the outcome met?	How were ASM and TG linked?	How were LA and TG linked?
Learners could identify types of sentences with the teacher. The outcome was met to the extent that the teacher intended for the single lesson, but not yet fully achieved.	Teacher's explanations and learners' answers enabled development of learners' knowledge and skills of sentence structures, but no activity was completed afterwards.	Only one learner at a time, and only those who were in class answered the teacher's questions.

The lesson's outcome (TG/ILOs) and teaching were well-aligned since the intended lesson content was covered through teacher-learner interaction (RO), with learners acting as information consumers. The assessment (ASM), however, was lacking since only teacher feedback, without any learner activity as proof of learning, was done. Online learners were not fully included (RO), therefore TAB was not well integrated. This lesson, therefore, had an average level of constructive alignment with irregular patterns on the radar charts illustrating this as well.

4.6.2.3 Roy's surface and deep learning analysis

Table 4-15. Analysis of Roy's surface and deep learning

Data sources	OBS1 Roy S, P and R
Lesson element	**Analysis**
Outcomes (TG/ILOs)	**Verbs from Bloom's taxonomy** Learners *identified* parts of a sentence by *analysing* it while the teacher explained the content.
	Skills developed • Identification of sentence types (content-driven) • No technical skills developed
Tablets (and other digital resources) (TAB)	**Manner of tool use** • Whiteboard used for teacher explanations. • Oral teacher-learner interaction • Online learners watched the lesson via MS Teams but were not involved.
Learning activities (LA)	**Types of questions** Learners identified and analysed sentence parts with the teacher.
Assessment (ASM)	**Measurement of surface/deep learning** Learners worked with the teacher to discuss examples as a whole class

Based on the elements of analysis in Table 4-15, Roy's lesson design involved individualised learning with a teacher-centred approach, but some deep learning occurred when learners analysed the sentence parts with the teacher. The design could, therefore, be regarded as individualised deep learning to some extent (Jahnke et al., 2014a).

4.6.3 Lily's first lesson

4.6.3.1 Lily's digital didactical design

In

Table 4-16, four radar charts of Lily's digital didactical design (i.e. one per observer as well as an average) are included. The general shape of all four charts is similar, mainly because Lily consulted the *DDD* observation sheet during her planning as seen on her lesson plan (CAR1 Lily D1). While Lily's self-observation scores were slightly lower, on average the lesson had scores of 4 and above. Lily's digital didactical design was classified as cluster A as defined by Jahnke et al. (2017) in Table 2-1.

Table 4-16. Lily's *DDD* radar charts for lesson 1

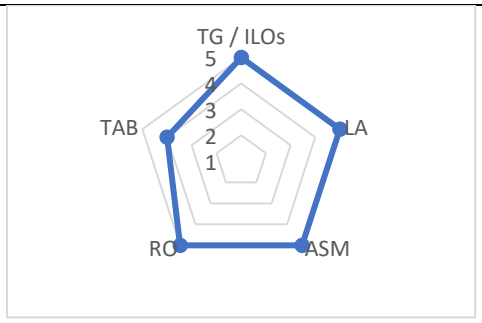
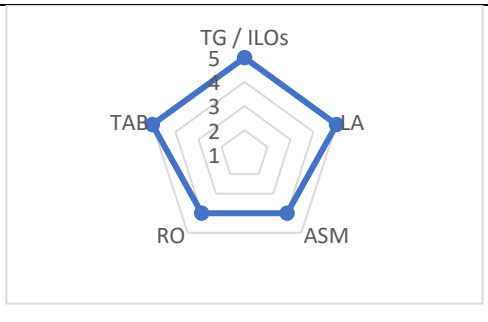
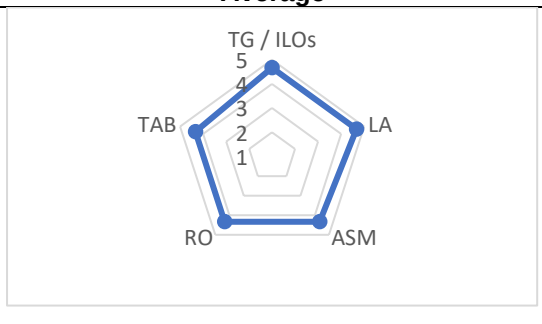
Self-observation	Peer-observation
	
Researcher observation	**Average**
	

Table 4-17 provides a summary of the scores for the *DDD* elements of the three observers during the observations. It also provides changed scores based on the

lesson reflections during FI4A. During the observation of this lesson, the self-observer, peer-observer, and the researcher's scores differed for all the elements, marked in blue (i.e. all elements). Scores that were changed during the reflection phase are marked in orange.

Table 4-17. *DDD* observation scores for Lily's lesson on the observation sheet and after reflection

DDD **elements**	**Self**	**Peer**	**Researcher**	**Average**
TG / ILOs	**Observation** 4	**Observation** 5	**Observation** 5	**Observation** 4,7
	Reflection 4	**Reflection** 5	**Reflection** 5	**Reflection** 4,3
LA	**Observation** 4	**Observation** 4	**Observation** 5	**Observation** 4,7
	Reflection 4	**Reflection** 5	**Reflection** 5	**Reflection** 4,7
ASM	**Observation** 4	**Observation** 5	**Observation** 4	**Observation** 4,3
	Reflection 4	**Reflection** 5	**Reflection** 4	**Reflection** 4,3
RO	**Observation** 4	**Observation** 5	**Observation** 4	**Observation** 4,3
	Reflection 4	**Reflection** 5	**Reflection** 4	**Reflection** 5
TAB	**Observation** 4	**Observation** 4	**Observation** 5	**Observation** 4,3
	Reflection 4	**Reflection** 4	**Reflection** 5	**Reflection** 5

The **TG/ILO** as well as its manner of presentation is summarised in Table 4-5. The TG/ILO was aimed at both the knowledge and skills levels, since learners developed their technical, social, and summarising skills while making the videos, while also focusing on the novel's content. According to Lily, the lesson's success was ascribed to learners' effective novel summaries by making videos (FI4A). Yet, Lily also criticised her own lesson for not including learners' co-aims, therefore she only gave a 4.

The lesson's **LA**, expressed as learner and teacher activities, is summarised in Table 4-5. The learners' videos made them act as producers who collaborated with their peers and accessed the internet. According to Lily and Alexis, the flipped classroom method engaged learners well. *("In comparison to my lesson, she actually involved more learners, because no one could fade in the background like in my lesson."). (Alexis – FI4A).* Learners delivered high quality videos, but if these videos were for marks, the quality would have further improved. They also reflected on their content

to use their newly attained knowledge in the test they wrote. They did well in this test, according to Lily (FI4A).

Alexis changed her LA score based on the wide variety of learning activities included to a 5. Lily's self-observed score of 4 was because she felt that her practice still needed improvement*. ("I always feel a person (I) can do a little bit better."). (FI4A).*

The **ASM** for this lesson, including the type of assessment and the assessors, is summarised in Table 4-5. The multiple-choice test and not the videos were assessed. While Lily appreciated the immediate feedback of online tests, she should have also formally assessed the videos for oral marks. The impact of this is twofold: *"I think the learners would have been more motivated to make higher quality videos if they counted towards oral marks. I would have saved time for myself as well, because then I could have done two assessments in one lesson." (FI4A).*

The lack of formal video assessment and learner feedback decreased Lily's self-and peer observed LA score. Since Alexis valued learner feedback from the start of the study (FI1), she suggested a class conversation about the videos to keep the flow of teacher-learner interaction going. *("She could have had a conversation with the class after watching every video to keep the teach-interaction, instead of them sitting and watching the videos for 10-15 minutes."). (FI4A).* The researcher indicated that in-class production would have enabled some formative feedback and teacher technical assistance.

The **RO** for this lesson is contained in Table 4-5. The teacher and learners assumed a variety of roles, although COVID-19's social distancing measures prevented learners to meet in person to film their videos. Instead, learners made individual videos and then collaborated to combine these. Lily enabled learner reflection on their assumed roles. This led to lower RO scores as awarded by Lily and the researcher.

Lily's *SAMR* level and tools used are included under **TAB** in Table 4-5. Lily focused on the number of technologies used and reflected that, the more apps were used, the more the TAB score increased. Lily gave only a 4, since a 5 would have indicated a move beyond her comfort zone by using new apps. *("The reason why I gave myself a 4 is because the learners have already used Flipgrid in other subjects (English), so I felt that it was not a new app."). (FI4A).* According to Alexis, David's use of digital tools could be classified as a 5, but Lily scored a 4 because she had not yet utilised so many

apps. *("I think for David one would easily give a 5, because you know that he would use 4 or 5 technology-based apps.").*

Lily's TAB ranged between 4 and 5, therefore placed at a *modification* level on the *SAMR*. A wide range of tools was used, and learners produced for a real audience (i.e. their peers). They had the opportunity to execute their choice in how content was presented and created videos using their tablets and apps. This lesson, therefore, was at level 4 (appropriation).

4.6.3.2 Lily's constructive alignment

Table 4-18 answers three questions that analyse the alignment among lesson design elements.

Table 4-18. Lily's constructive alignment for lesson 1

To what extent was the outcome met?	How were ASM and TG linked?	How were LA and TG linked?
Learners summarised their assigned chapters from the novel by making videos. They wrote a test afterwards.	Learners provided evidence of their knowledge by designing videos and writing the online test.	The making and watching of group videos enabled learners to recap the novel content and prepare for the online test.

The lesson's outcome (TG/ILOs) was reached through collaborative video-making (RO and TAB), whereby the assessment (ASM) and teaching (LA) were relevant. All *DDD* elements scored 4 and above, therefore this lesson design was constructively well-aligned.

4.6.3.3 Lily's surface and deep learning analysis

Table 4-19. Analysis of Lily's surface and deep learning

Data sources	OBS1 Lily S and R; CAR1 Lily D1
Lesson element	**Analysis**
Outcomes (TG/ILOs)	**Verbs from Bloom's taxonomy** Learners had to *summarise* the novel content and *make* videos using Flipgrid by *collaborating.*
	Skills developed • Content knowledge: Summary skills • Technical skills: Designing videos using Flipgrid
Tablets (and other digital resources) (TAB)	**Manner of tool use** • Online creation through collaboration using Flipgrid • Learners consulted online sources for information gathering and test writing.
Learning activities (LA)	**Types of questions** Learners were designers as reflected in the activity prompt.
Assessment (ASM)	**Measurement of surface/deep learning** Video-making allowed for creation (level 6), while the test was at the application level (level 3). Analysis and evaluation also occurred during video design.

Based on the elements of analysis in Table 4-19, Lily's lesson involved effective collaborative learning such as application, some analysis and evaluation as well as creation. The approach was highly learner-centred, and learners acted as producers. While application-level activities were also done, learners functioned at the highest cognitive levels in groups, therefore collaborative deep learning occurred (Jahnke et al., 2014a).

4.6.4 Alexis' first lesson

4.6.4.1 Alexis' digital didactical design

In Table 4-20, four radar charts of Alexis' digital didactical design (i.e. one per observer as well as an average) are included. The observers' charts display differences in observations, but on average, the design scored 3s and 4s, while TAB had an average of 2 and above. The design classified as cluster B as defined by Jahnke et al. (2017) in Table 2-1.

Table 4-20. Alexis' *DDD* radar charts for lesson 1

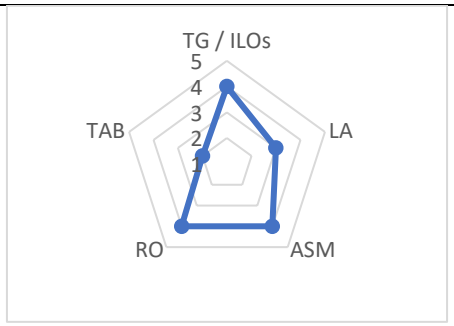
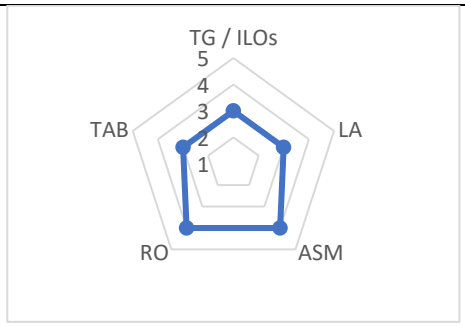
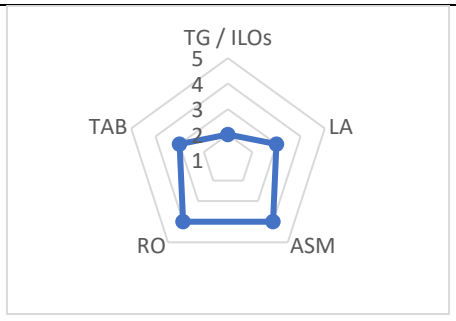
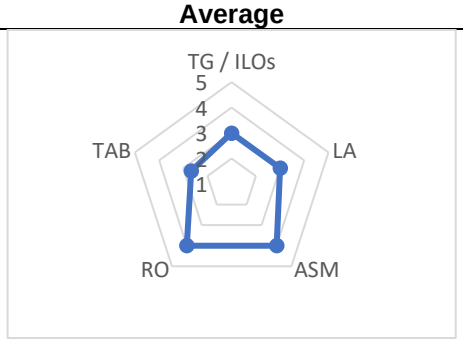
Self-observation	Peer-observation
	
Researcher observation	**Average**
	

Table 4-21 provides a summary of the scores for the *DDD* elements of the three observers during the observations. It also provides changed scores based on the lesson reflections during FI4A. During the observation of this lesson, the self-observer,

peer-observer, and the researcher's scores differed for two of the elements, marked in blue (i.e. TG/ILOs and TAB). No scores were changed during the reflection phase.

Table 4-21. *DDD* observation scores for Alexis' lesson on the observation sheet and after reflection

***DDD* elements**	**Self**	**Peer**	**Researcher**	**Average**
TG / ILOs	**Observation** 4	**Observation** 3	**Observation** 2	**Observation** 3
	Reflection 4	**Reflection** 3	**Reflection** 2	**Reflection** 3
LA	**Observation** 3	**Observation** 3	**Observation** 3	**Observation** 3
	Reflection 3	**Reflection** 3	**Reflection** 3	**Reflection** 3
ASM	**Observation** 4	**Observation** 4	**Observation** 4	**Observation** 4
	Reflection 3	**Reflection** 4	**Reflection** 4	**Reflection** 4
RO	**Observation** 4	**Observation** 4	**Observation** 4	**Observation** 4
	Reflection 4	**Reflection** 4	**Reflection** 4	**Reflection** 4
TAB	**Observation** 2	**Observation** 3	**Observation** 3	**Observation** 2,7
	Reflection 2	**Reflection** 3	**Reflection** 3	**Reflection** 2,7

The **TG/ILO** as well as its manner of presentation is summarised in Table 4-6. The TG was briefly presented orally, but learners were still confused (OBS1 Alexis R). Alexis indicated that she should have spent more time on providing clear lesson expectations. Lily supported this. *("I think it was a very good lesson for her stronger learners, but in a way the weaker learners fell behind, especially those who are struggling with Afrikaans"). (FI4A).*

The TG focused on content at a higher cognitive level, where learners designed questions on language structures, analysing the rules behind the structures. For Alexis, this high-level TG was a lesson strength, therefore she awarded a 4. For Lily, however, the observation was focused not on good lesson design in general but on the use of technology. The oral presentation of the TG, therefore, received a 3 from Lily. *("For me, it is not about whether it is a good lesson in general, but specifically about the technology and DDD."). (FI4A).*

The lesson's **LA**, expressed as learner and teacher activities, is summarised in Table 4-6. Lily and the researcher appreciated the value of learner choice in the design of

the questions. *("They (the learners) could say, 'We are struggling with this' and then they could get an explanation of that."). (Lily – FI4A).* The classroom and online participation of learners during the lesson was also a strength (OBS1 Alexis R). Since the quiz was setup in class, learners' level of engagement was low according to Lily and the researcher. While this did not cause disciplinary problems, Lily suggested that the quiz should rather be setup before class.

The **ASM** for this lesson, including the type of assessment and the assessors, is summarised in Table 4-6. Alexis found the method of assessment effective, but only learners who provided questions for the quiz received feedback on their designed questions. Both Alexis and Lily, however, appreciated the immediate summative feedback provided to all learners after writing online tests. *("The learners can see their results immediately after writing and submitting the test. I liked this, as it gives instant feedback to the learners."). (Lily – FI4A).* The pro-assessment visible in this lesson (i.e. learners actively contributed to the content of the assessment) was a strength.

The **RO** for this lesson is contained in Table 4-6. While teacher-learner conversation dominated according to Alexis, the lesson promoted active learner engagement according to Lily. Lily suggested that the teacher ought to support the learners to reflect on their roles and the development of new roles (FI4A).

Alexis' *SAMR* level and tools used are included under **TAB** in Table 4-6. While Alexis had used the MS quiz function before, the learners enjoyed the activity so much that she would use this tool more often in future. On the other hand, she gave herself a low TAB score due to her familiarity with the tool and too little technology used. *("I think I could have incorporated another 'method/channel' during the lesson.). (FI4A).*

Instant feedback during online testing and the involvement of both in-class and online learners were enabled by the digital tools at hand. Lily and the researcher commended the inclusive nature of the lesson. *("I liked how the teacher makes a point to engage the learners at home (due to Covid-19) in the lesson."). (Lily - FI4A).*

Alexis' TAB was the weakest element and ranged between scores of 2 and 3, therefore placed at the *augmentation* level of the *SAMR*. Alexis included digital tools in ways that learners could contribute to the production of new materials. She used the tools to improve productivity, while assisting with the management and administration of

assessment. For these reasons, this lesson functioned at the third level of technology integration (i.e. adaptation).

4.6.4.2 Alexis' constructive alignment

Table 4-22 answers three questions that analyse the alignment among lesson design elements.

Table 4-22. Alexis' constructive alignment in lesson 1

To what extent was the outcome met?	How were ASM and TG linked?	How were LA and TG linked?
Learners designed high-level quiz questions on language rules and completed the online quiz. The outcome was met very well.	Learners wrote the quiz on MS Teams that used their own questions to test their language structure knowledge.	Learners' designed questions were used in the online multiple-choice test.

The lesson's outcome (TG/ILOs) was reached through individual question design by learners (RO) and the assessment was completed online (ASM and TAB). The ASM was effectively guided by the LA and the TG. The observers disagreed on the level of constructive alignment. Alexis felt that the three elements were perfectly combined, while Lily felt that the combination could have been smoother (OBS1 Alexis S and P). Among the TG/ILOs, LA and ASM, the researcher observed a high-level of constructive alignment (OBS1 Alexis R). While most *DDD* elements scored 3 and higher on the observation sheets, TAB scored between 2 and 3. Due to the TAB average, this lesson design had average constructive alignment.

4.6.4.3 Alexis' surface and deep learning analysis

Table 4-23. Analysis of Alexis' surface and deep learning

Data sources	OBS1 Alexis S, P and R
Lesson element	**Analysis**
Outcomes (TG / ILOs)	**Verbs from Bloom's taxonomy** Learners *designed* their own quiz questions on language structures. They *wrote* the test afterwards
	Skills developed • Content: Analysis of language structures; constructing test questions • Existing skill used: Writing online tests.
Tablets (and other digital resources) (TAB)	**Manner of tool use** • Tablets and MS Teams were used to write the test. • MS Teams enabled online learning
Learning activities (LA)	**Types of questions** Learners designed high-level test questions that identified the language structure rules (i.e. analysis) and did not merely apply the rules.
Assessment (ASM)	**Measurement of surface/deep learning** In multiple-choice format, learners completed analysis questions.

Based on the elements of analysis in Table 4-23, Alexis' lesson involved individual deep learning, where learners analysed language structures critically on their own (Jahnke et al., 2014a).

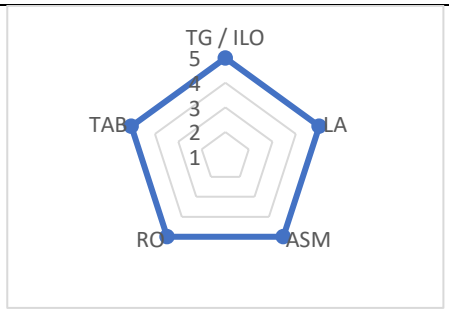
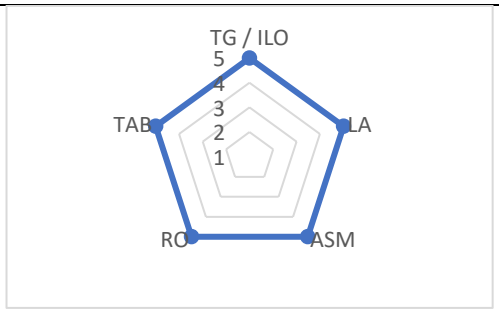
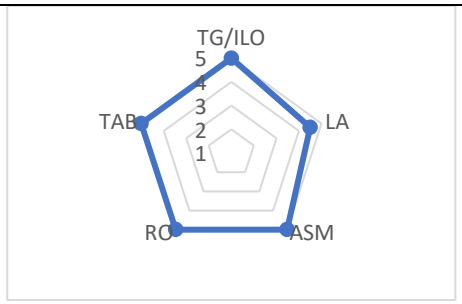
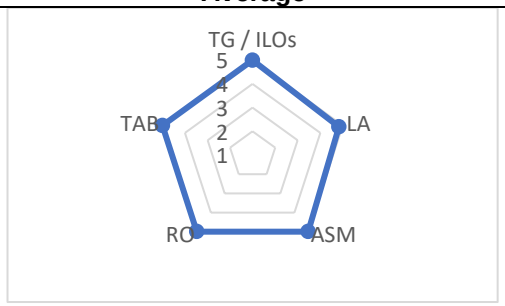
4.7 Lesson 2: Presentation, observation, and reflection (CAR cycle 2)

4.7.1 David's second lesson

4.7.1.1 David's didactical design

The digital didactical designs of David's second lesson are captured in Table 4-24.

Table 4-24. David's *DDD* radar charts for lesson 2

Self-observation	Peer-observation
	
Researcher observation	**Average**
	

During the observation, David gave his lesson 4s for ASM and RO, but he changed these scores to 5s during the reflection, based on the discussions of the meanings of terms. After this, the scores agreed well among the various observers, with only a slight difference on the researcher's LA score. Since David's lesson design scored 4 and above with an average design of close to 5, it was classified as cluster A as defined by Jahnke et al. (2017) in Table 2-1.

Table 4-25 provides the scores for the *DDD* elements of the three observers during the observations. It also indicates where scores differed among observers (ASM, RO and TAB) in blue and how scores were changed during the lesson reflections (FI6E) (ASM, RO and TAB) in orange.

Table 4-25. *DDD* observation scores for David's second lesson on the observation sheet and after reflection

***DDD* elements**	**Self**	**Peer**	**Researcher**	**Average**
TG / ILOs	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
LA	**Observation** 5	**Observation** 5	**Observation** 4,5	**Observation** 4,8
	Reflection 5	**Reflection** 5	**Reflection** 4,5	**Reflection** 4,8
ASM	**Observation** 4	**Observation** 5	**Observation** 5	**Observation** 4,7
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
RO	**Observation** 4	**Observation** 5	**Observation** 5	**Observation** 4,7
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
TAB	**Observation** 4	**Observation** 5	**Observation** 5	**Observation** 4,7
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5

The **TG/ILO** as well as its manner of presentation is summarised in Table 4-3. The outcome aimed to showcase learners' knowledge on the content of *Spud*, while also expanding their summary skills and their technical skills as they used as MS PowerPoint template for video design. David indicated that the strength of his lesson was that learners knew what was expected of them, thereby achieving the outcome. *("I think my learners understood the assignment quite easily; they understood it from the start and the objective was definitely met."). (FI6E).*

The lesson's **LA**, expressed as learner and teacher activities, is summarised in Table 4-3. This lesson's LA involved the flipped classroom teaching strategy, since learners watched YouTube tutorials to assist them with animated MS PowerPoint video design.

The **ASM** for this lesson, including the type of assessment and the assessors, is summarised in Table 4-3. In David's original self-observation, he gave himself a 4 for ASM because he could not identify a plan for formative assessment. During the reflection, however, David realised that he did plan for assessment in various forms, therefore he changed his self-observation score to a 5. *("I think, for me, I thought there has to be a plan, but now if I think back: It was part of the plan. I think I'm just looking for a specific assessment plan."). (FI6E).*

On the value of peer assessment, David indicated that *"it takes the responsibility from the teacher deciding what is the best and gives it to the learner." (FI6E).* David also noticed that peer-assessment made learners submit a higher quality of work since their peers would see this. David regarded it as *"positive peer pressure" (FI6E).*

The **RO** for this lesson is contained in Table 4-3. David's role as facilitator during this lesson is summarised well in this statement: *"To expand knowledge…expand creativity, and also to show the learners that they can do things in different ways." (Roy – OBS2 David P).* David indicated that his guidance assisted learners as his suggestions (made from his own experience) helped learners to better manage their own design and planning (FI7). A vital aspect, learner reflection, was added to the lesson, where learners peer-assessed, thereby acting as critical reflectors on their own and their peers' work.

David's *SAMR* level and tools used are included under **TAB** in Table 4-3. Roy indicated that David's use of a wide variety of tools enabled a more advanced learning activity. *("Well, I think it is … if we had done it on ... with pen and paper, it would be a different outcome, but being able to do it on a platform like a PowerPoint or something like that gives them the ability to create things in a much more advanced manner. So, it is taking the basics that they learnt at an earlier age with a new level and being able to advance that." (Roy – OBS2 David P).* The use of PowerPoint on a mobile device was challenging, however, since not all desktop functions, such as animations, were available*. ("You know, it is the same program, but it is not the same on an iPad"). (David – FI6E).* This decreased David's self-assessment score for TAB. Fortunately, some learners solved the problem by working on a computer at home instead.

All observers, after reflecting, gave David's TAB a 5. This signified a lesson design that functioned at the *redefinition* level. At the same time, the combination of lesson elements took David's level to a level 5 of technology integration, since the lesson design experimented with learners using MS PowerPoint to create, collaborate, and reflect (Department of Education, 2007; Sandholtz et al., 1997).

4.7.1.2 David's constructive alignment

Table 4-26 answers three questions that analyse the alignment among lesson design elements.

Table 4-26. David's constructive alignment in lesson 2

To what extent was the outcome met?	How were ASM and TG linked?	How were LA and TG linked?
Learners managed to create group MS PowerPoint videos and assessed their peers' work. The outcome was met very well.	The peer- and teacher assessment measured the quality of learners' digital stories.	The activity prompt, teacher assistance, and peer interaction supported learners to create and assess their videos.

The lesson's outcome (TG/ILOs) was reached through online collaboration (RO and TAB) and creation, therefore the assessment (ASM) and teaching (LA) were relevant and well executed. All *DDD* elements scored 4 and higher on the observation sheets, therefore this lesson design was constructively well-aligned.

4.7.1.3 David's surface and deep learning

Table 4-27. Analysis of David's surface and deep learning

Data sources	OBS2 David S, P and R; CAR2 David D1 and D2
Lesson element	**Analysis**
Outcomes (TG/ILOs)	**Verbs from Bloom's taxonomy** **Activity prompt (CAR2 David D1):** Learners *chose* a scene and *retold* the story, but in a digital animation format. Learners *scored* another group's PowerPoint video. **Observation sheets:** All levels of Bloom's taxonomy (OBS2 David S), and higher levels (analyse to create) (OBS2 David P; OBS2 David R)
	Skills developed • Novel *(Spud)* content knowledge • Technical skills: Used MS PowerPoint template; shared online resources; online peer-assessment
Tablets (and other digital resources) (TAB)	**Manner of tool use** • Digital final products, online sharing of ideas, and peer assessment • MS PowerPoint: Learners produced own videos
Learning activities (LA)	**Types of questions** Prompts for learners to design digital stories while collaborating online with their peers
Assessment (ASM)	**Measurement of surface/deep learning** Peer assessment: Quality of work and feedback on improvement assessed (i.e. peer-reflective learning)

On the observation sheets, various reasons for deep learning were provided. The researcher observed that deep learning occurred because learners created their own representations of a scene using MS PowerPoint, peer inputs, and internet sources. (OBS2 David R). David stated that *"the learners had to engage with the content of the*

novel to create the stories. They had to make the stories their own." (OBS2 David S). Roy indicated that both surface and deep learning occurred. *("It was surface and deep. Surface in the sense that they were … we were trying to teach them aspects of the book, but also deeper learning in the way that they went about expanding on that knowledge."). (OBS2 David P).*

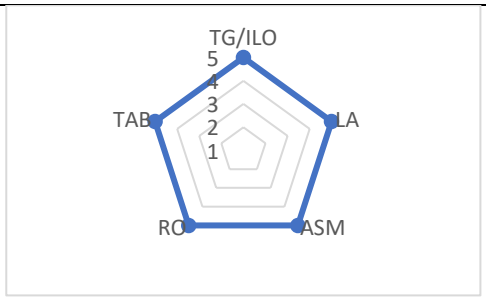
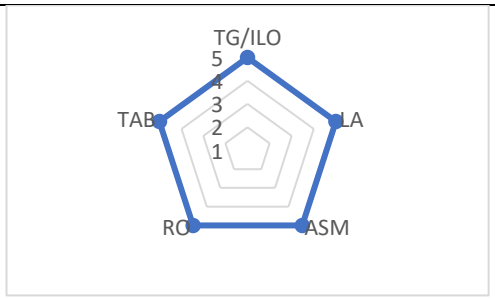
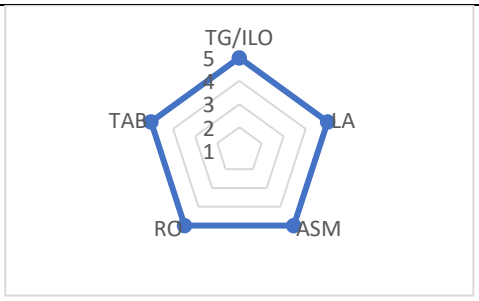
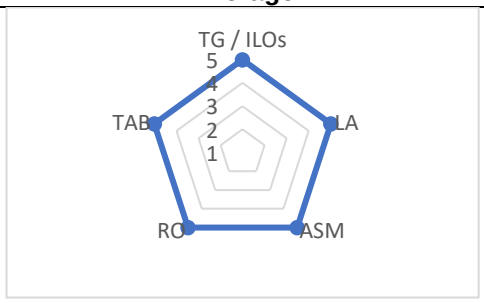
In conclusion, this lesson design was highly learner-centred, it involved peer-reflective learning through group work, and peer assessment as seen in Table 4-27. Since learners made their own digital stories, they were producers. Based on these descriptions, learners functioned at the *evaluate* and *create* levels of Bloom's taxonomy. For this reason, this lesson involved collaborative deep learning as defined by Jahnke et al. (2014a).

4.7.2 Roy's second lesson

4.7.2.1 Roy's didactical design

The digital didactical designs of Roy's second lesson are captured in Table 4-28.

Table 4-28. Roy's *DDD* radar charts for lesson 2

Self-observation	Peer-observation
	
Researcher observation	**Average**
	

The lesson observers agreed on almost all the scores, except for ASM. David changed the ASM score from 4 to a 5 during the reflection phase, owing to the discussion of the meaning of the observation sheet's criteria. Based on the visual radar charts and

the scores that were exclusively in the 5-category, a clear cluster A design was seen as defined by Jahnke et al. (2017) in Table 2-1.

Table 4-29 provides the scores for the *DDD* elements of the three observers during the observations. It also indicates where scores differed among observers in blue and how scores were changed during the lesson reflections (FI6E) in orange.

Table 4-29. *DDD* observation scores for Roy's second lesson on the observation sheet and after reflection

***DDD* elements**	**Self**	**Peer**	**Researcher**	**Average**
TG / ILOs	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
LA	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
ASM	**Observation** 5	**Observation** 4	**Observation** 5	**Observation** 4,7
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
RO	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
TAB	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5

The **TG/ILO** and its manner of presentation is summarised in Table 4-4. Learners developed their poetry knowledge while creating good animations using MS PowerPoint (i.e. expanding technical skills as well as subject knowledge). *("If I look at the animations that were given (submitted at the end of the day) they all made sense; they covered the topic. Everyone really was very enthusiastic about doing this."). (David - FI6E).*

The lesson's **LA**, expressed as learner and teacher activities, is summarised in Table 4-4. The learners created presentations containing information, narrations, slide transitions, pictures, and music. The presentations were personalised, although some were presented more verbatim and others more naturally. (OBS2 Roy R). Some of the presentations did not properly adhere to PowerPoint design principles. *("I felt that they*

wanted to say every single thing that was on the PowerPoint and it was almost cluttered."). (David – FI6E).

The collaboration enabled by the tools (i.e. MS Teams and PowerPoint) was beneficial amidst Covid-19 social interaction restrictions. These online interactions were more easily monitored by the teacher during the lesson. Learners could also associate better with modern songs studied as poetry. *("They felt a little bit of more connection to it because it was a song and I think also that they enjoyed.") (Roy – FI6E).* David agreed with Roy.

The **ASM** for this lesson, including the type of assessment and the assessors, is summarised in Table 4-4. While neither of the rubrics were available for learners beforehand, the activity prompt gave clear instructions about the expectations of the activity. According to Roy and David, learners struggled with the peer-assessment because they did not understand the assessment process and struggled to assess somebody else's work. *("They find it difficult to assess things because they cannot take themselves out of it."). (Roy – FI6E).* Despite the challenges, learners gained skills as critical reflectors. *("The benefits of the peer-assessment are for the kids to learn how to assess things, and in learning how to assess things they also learn more about their own work."). (Roy – FI6E).*

David initially awarded a 4 due to no visible teacher's plan for formative assessment (i.e. no formal marks were given), but he reconsidered the lesson's included peer and teacher assessment. He then changed his score to a 5.

The **RO** for this lesson is contained in Table 4-4. Roy indicated that scaffolding was important for the success of the lesson. *("I had to scaffold a lot of the stuff so that all the learners were able to understand what was required of them."). (FI6E).* In essence, he acted as facilitator (OBS2 Roy P). *("The roles changed from being someone who is giving information to someone who is facilitating the tools of how to get information."). (Roy - FI6E).* During FI1, Roy indicated that teachers were not yet facilitators because *"I don't think we're at a place in our mental or social capacity at the moment to do that…".* During the FI7 reflection, Roy still felt that that there was a glorification of the teacher's role as facilitator. Learners were actively engaged and assumed a variety of roles. When asked on how learners coped with their variety of roles, Roy stated the following: *"In any group you have leaders, and you have*

followers. So, obviously the leaders took the fore and led the groups and allocated things, where the followers followed their lead." (FI6E).

David made a mistake in his awarding of a 4 while all the category 5 descriptions were ticked. The score for RO was changed during the reflection (FI6E).

Roy's *SAMR* level and tools used are included under **TAB** in Table 4-4. The tools used enabled collaboration and changed learners' roles. *("The technology enabled learners to become collaborative creators, not mere content receivers."). (OBS2 Roy R).* According to David, learners enjoyed the freedom to create and learn (OBS2 Roy P). They also explored their own learning abilities and expanded their technical skills by using different tools (OBS2 Roy S).

Technology not only enabled collaboration in Roy's lesson, but it also assisted learners to complete the activity and the peer-assessment. *("They were able to use the technology effectively to allocate roles, and also use technology to basically fulfil the tasks. They also were able to… we used a lot of technology to assess as well and I think it was nice."). (Roy – FI6E).*

All observers gave Roy's TAB a 5. This signified a lesson design that functioned at the *redefinition* level of the *SAMR*. At the same time, the combination of lesson elements took Roy's lesson design to a level 5 of technology integration, as the lesson design experimented with learners using MS PowerPoint to create and collaborate, while they had to reflect on their peer's work through peer assessment as well (Department of Education, 2007; Sandholtz et al., 1997).

4.7.2.2 Roy's constructive alignment

Table 4-30 answers three questions that analyse the alignment among lesson design elements.

Table 4-30. Roy's constructive alignment in lesson 2

To what extent was the outcome met?	How were ASM and TG linked?	How were LA and TG linked?
The outcome was met fully because learners managed to create meaningful MS PowerPoints.	Both assessments measured learners' oral and presentation skills, while peer-assessment exposed learners to the challenge of assessing other people's work.	Learners needed to collaborate to locate information about the song and analyse and represent its content using MS PowerPoint and other tools.

Based on the lesson outcome (TG/ILOs), the teaching (LA) and assessment (AS) were well aligned and achieved through learners' collaboration (RO) with tablets and MS Teams (TAB). The high level of constructive alignment was also visible in the radar charts since all elements scored equally high scores.

4.7.2.3 Roy's surface and deep learning

Table 4-31. Analysis of Roy's surface and deep learning

Data sources	OBS2 Roy S, P and R; CAR2 Roy D1
Lesson element	**Analysis**
Outcomes (TG/ILOs)	**Verbs from Bloom's taxonomy** **Activity prompt (CAR2 Roy D1):** Learners had to *select* and *analyse* a song while *collaborating*. They had to do *research*, *annotate* the song, and *compile* a presentation and *present* the PowerPoint orally. **Observation sheets:** All levels of Bloom's taxonomy (OBS2 Roy S and P), and higher levels (analyse to create) (OBS2 Roy R)
	Skills developed • Poetry (songs) content knowledge • Technical skills: Used MS PowerPoint to make narrated videos; online collaboration; online peer-assessment
Tablets (and other digital resources) (TAB)	**Manner of tool use** • Digital final products, online sharing of ideas, and peer-assessment • PowerPoint: Learners produce own videos
Learning activities (LA)	**Types of questions** The activity prompts had learners design narrated MS PowerPoints while collaborating online with their peers.
Assessment (ASM)	**Measurement of surface/deep learning** Learners did online peer-assessment, but were challenged by this practice (i.e. peer-reflective learning).

Based on the discussion of surface and deep learning in Table 4-31, Roy's learners were engaged in higher-order activities through the use of technology (Florida Center for Instructional Technology, 2020).

On the observation sheets, Roy indicated that both surface and deep learning were involved, since learners learnt new content and skills while using the tools. *("They're learning the techniques of research and being able to put together stuff."). (OBS2 Roy S).* The researcher observed deep learning owing to collaboration and creation, as well as the types of activities (i.e. Bloom's cognitive levels). David referred to learners' application of their knowledge (OBS2 Roy P). In conclusion, this lesson design was highly learner-centred, since it involved peer-reflective learning through group work and peer assessment. Learners acted as producers while making their own narrated MS PowerPoints. Based on these descriptions, learners functioned mainly at the

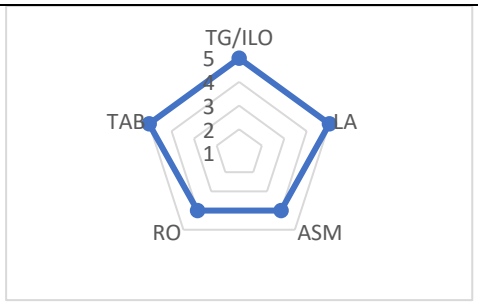
evaluate and *create* levels of Bloom's taxonomy, therefore this lesson involved collaborative deep learning as defined by Jahnke et al. (2014a).

4.7.3 Lily's second lesson

4.7.3.1 Lily's didactical design

The digital didactical designs of Lily's second lesson are captured in Table 4-32.

Table 4-32. Lily's *DDD* radar charts for lesson 2

Self-observation	Peer-observation
	
Researcher observation	**Average**
	

The self and peer-observers awarded the same scores, while the researcher had different scores. On average, Lily's lesson scored 4 and above for all categories. The learners assumed different roles in using a generic app (i.e. *Powtoon*), therefore the activities were not possible without tablets and technology (Jahnke et al., 2017). Although the ASM was not entirely process-based, this design is a cluster A digital didactical design according to Jahnke et al. (2017) in Table 2-1.

Table 4-33 provides the scores for the *DDD* elements of the three observers during the observations. It also indicates where scores differed among observers in blue and how scores were changed during the lesson reflections (FI6E) in orange.

Table 4-33. *DDD* observation scores for Lily's second lesson on the observation sheet and after reflection

***DDD* elements**	**Self**	**Peer**	**Researcher**	**Average**
TG / ILOs	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
LA	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
ASM	**Observation** 4	**Observation** 4	**Observation** 3	**Observation** 3,7
	Reflection 4	**Reflection** 4	**Reflection** 4	**Reflection** 4
RO	**Observation** 4	**Observation** 4	**Observation** 5	**Observation** 4,3
	Reflection 4	**Reflection** 4	**Reflection** 5	**Reflection** 4,3
TAB	**Observation** 5	**Observation** 5	**Observation** 4	**Observation** 4,7
	Reflection 5	**Reflection** 5	**Reflection** 4	**Reflection** 4,7

The **TG/ILO** and its manner of presentation is summarised in Table 4-5. Alexis highlighted the value of Lily's clear communication of TG. *("The children know exactly what is expected of them."). (FI6A).* Alexis also noticed the different approach to film reports that Lily used, while Lily and Alexis highlighted the need for learner creativity. *("The learners had to use their creative side and approach film study in a different way by using videos"). (OBS2 Lily P).* Lily also indicated the importance of independent thinking and objective opinion formation while completing the activity.

The lesson's **LA**, expressed as learner and teacher activities, is summarised in Table 4-5. Lily highlighted learners' active involvement, reflective learning, collaboration, and a live audience for the learners' videos (i.e. their peers as peer assessors) (OBS2 Lily S). One downfall, however, was the lack of real collaboration due to social distancing measures. Lily reflected that, given different circumstances, this would have been a group project to increase learner inputs through collaboration, and to decrease the teacher marking load (FI6A).

The **ASM** for this lesson, including the type of assessment and the assessors, is summarised in Table 4-5. Lily highlighted that learners had to employ their creativity

while using technology. *("The learners must create a Powtoon to deliver their work in a creative way while using technology."). (OBS2 Lily S).*

In terms of scores, the researcher initially gave a 3, due to lacking formative feedback in class, but reflected that a plan for formative evaluation existed, and that a range of assessments were used. Owing to this, the score changed to a 4. Alexis ticked one additional criterion under ASM during the reflection (*Feedback/feed-forward at the end, but mainly process-based assessment for learners' development*), since the YouTube tutorial videos provided continuous guidance to learners (FI6A). This criterion did not change her score. According to Lily, she had no formative evaluation plan and Alexis agreed since assessment occurred based on learners' end products alone (FI6A).

Lily reflected that peer assessment was valuable because learners learned from one another when looking at each other's work. She regretted that she did not include formative assessment due to its potential added value. *("Let's say they work in pairs, then they could have motivated each other from the beginning."). (FI6A).*

The **RO** for this lesson is contained in Table 4-5. Lily indicated that the teacher "*gives the learners all the tools they need to create an insightful review and a Powtoon." (OBS2 Lily S).* During FI7, Lily indicated that she tried to be a learning facilitator in both of her lessons by the way in which she gave learners the tools to create new things. Her YouTube tutorials could be revisited as often as learners preferred and these videos were more interesting than her own explanations (Lily - FI6A).

Both Alexis and Lily awarded 4s for this element because the teacher did not fulfill more than two roles (i.e. facilitator and mentor) (OBS2 Lily P) and did not provide continuous support to learners (FI6A). Yet, the activity prompt was so comprehensive that learners could work independently. *("I think she explains everything perfectly and that actually also causes that learners do not really need her, since they can go back to the document which contains the assignment."). (Alexis - FI6A).* On the other hand, the researcher observed that the students were not in as many different roles (OBS2 Lily R), but Lily believed that learners adapted to their roles well. *("I think it was very nice to see the different roles learners assumed and how they totally and with both hands embraced it."). (FI6A).*

Lily's *SAMR* level and tools used are included under **TAB** in Table 4-5. The technologies were used in such a way that *"without the technology (Powtoon website) learners (would) not be able to create their film reports in animated video format (more creative elements rather than text only were included e.g. music, pictures, animations, use of characters, internet pictures and information)". (OBS2 Lily R).* Lily indicated that *Powtoon* videos enabled learners to do familiar things (i.e. film reviews) in new ways. This was beneficial because *"they learn new skills that they can use in the future in other presentations or assessments." (OBS2 Lily S).* The best *Powtoons,* according to Lily, were those that contained high quality writing or a complete change of the provided template.

Lily and Alexis gave Lily's TAB a 5, while the researcher gave a 4. The lack of true collaboration influenced this score. Lily tried to incorporate collaborative work through peer-assessment, although this alluded to assessment and not collaborative creation (FI6A - Lily).

Lily's average TAB score of above 4 is at the *modification* level with a tendency towards the *redefinition* level of the *SAMR*. In terms of levels of technology integration, Lily's lesson functioned at level 4 (*appropriation*). Since Lily now appreciates the value of technology, she included technology-based, more learner-centred activities, although high levels of collaboration were not yet practical to implement due to social distancing measures. She employed new strategies (Sandholtz et al., 1997) (i.e. YouTube tutorials that replaced teacher explanations) and learner choice (Florida Center for Instructional Technology, 2020) for the design of learners' *Powtoon* videos.

4.7.3.2 Lily's constructive alignment

Table 4-34 answers three questions that analyse the alignment among lesson design elements.

Table 4-34. Lily's constructive alignment in lesson 2

To what extent was the outcome met?	How were ASM and TG linked?	How were LA and TG linked?
The outcome was met very well because learners created *Powtoon* videos that adhered to all the criteria and were creative.	By creating the Powtoon videos, learners adhered to the TG/ILO by covering the film's content, learners' own opinions, language development, and technical skillset (Powtoon design) development.	While designing and assessing their videos, learners covered the lesson content, included their opinions, employed creativity, saw other learners' work, and developed their technical skillsets.

The lesson's outcome (TG/ILOs) was reached through online creation (TAB) and assessed by peers and the teacher (RO and TAB). The assessment (ASM) was directly linked to the LA. All *DDD* elements scored 4 and higher on the observation sheets, therefore this lesson design was constructively well-aligned.

4.7.3.3 Lily's surface and deep learning

Table 4-35. Analysis of Lily's surface and deep learning

Data sources	OBS2 Lily S, P and R; CAR2 Lily D1; CAR2 Lily D2
Lesson element	**Analysis**
Outcomes (TG/ILOs)	**Verbs from Bloom's taxonomy** **Activity prompt (CAR2 Lily D1):** Learners *wrote* a film review and *produced* a *Powtoon* video. They *summarised* the story, *identified* highlights and low lights, and *rated* the film with a score and their own opinion. Learners *peer-assessed* each other's work. **Observation sheets:** All levels of Bloom's taxonomy (OBS2 Lily S), Understand to create (OBS2 Lily P) and higher levels (analyse to create) (OBS2 Lily R)
	Skills developed • Summarising skills • Technical skills: Use of *Powtoon*s to do book reports
Tablets (and other digital resources) (TAB)	**Manner of tool use** • *Powtoon*: Individual creative design of videos • Tutorial videos: Guidance on design • Completion of online peer-assessment
Learning activities (LA)	**Types of questions** • Activity prompt required analysis and video production in creative ways. • Evaluative thinking during peer assessment
Assessment (ASM)	**Measurement of surface/deep learning** Peer assessment: Evaluated learners' originality, language use, and layout of the video.

On the observation sheets, Lily provided a highly detailed, valuable description of deep learning in her lesson: *"The activity focuses on deep, meaningful learning where the learners have to be actively involved with the creating of their own, authentic film review. They have to be reflective on the content of the film Die Pro, while focusing on the goals set out for them on the activity prompt. Students collaborate by peer assessing, which also creates a live audience for the learners' work. The students will produce/create a Powtoon of their work, which will help the structure and organise their own content into a coherent whole. To help the students create their Powtoons, we will watch Tutorial videos on the internet." (OBS2 Lily S).* This type of higher-order learning once again highlighted and supported the notion of deep learning in Lily's lesson.

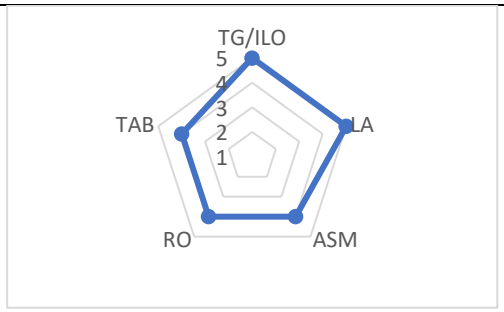
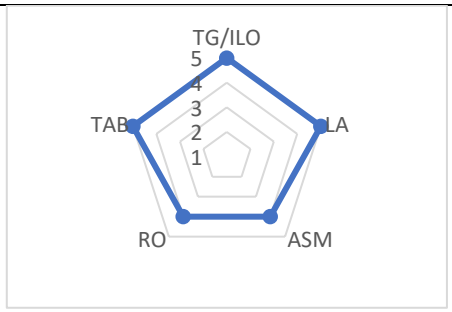
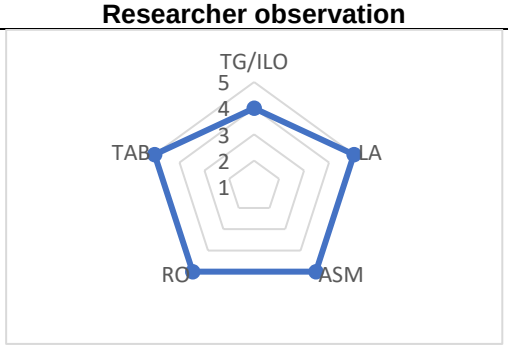
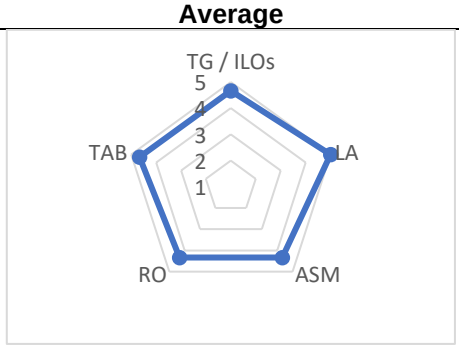
Lily's type of deep learning is analysed in Table 4-35 and based on the surface and deep learning framework by Jahnke et al. (2014a). Since evaluation and creativity were applied by individuals (i.e. *individualised deep learning*), and collaborative peer-assessment was done, this lesson design was classified as collaborative deep learning.

4.7.4 Alexis' second lesson

4.7.4.1 Alexis' didactical design

The digital didactical designs of Alexis' second lesson are captured inTable 4-36.

Table 4-36. Alexis' *DDD* radar charts for lesson 2

Self-observation	Peer-observation
	
Researcher observation	**Average**
	

During the observation phase, the researcher awarded the highest scores. On average, the AS, RO, and TAB had scores of 4 and above, while TAB and LA had 5s. Based on the cluster descriptions by Jahnke et al. (2017) in Table 2-1, this lesson was a cluster A lesson.

Table 4-37 provides the scores for the *DDD* elements of the three observers during the observations. It also indicates where scores differed among observers (i.e. ASM, RO and TAB) in blue and how scores were changed during the lesson reflections (i.e. TG/ILOs and TAB) in orange.

Table 4-37. *DDD* observation scores for Alexis' second lesson on the observation sheet and after reflection

***DDD* elements**	**Self**	**Peer**	**Researcher**	**Average**
TG / ILOs	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 4	**Reflection** 4,7
LA	**Observation** 5	**Observation** 5	**Observation** 5	**Observation** 5
	Reflection 5	**Reflection** 5	**Reflection** 5	**Reflection** 5
ASM	**Observation** 4	**Observation** 4	**Observation** 5	**Observation** 4,3
	Reflection 4	**Reflection** 4	**Reflection** 5	**Reflection** 4,3
RO	**Observation** 4	**Observation** 4	**Observation** 5	**Observation** 4,3
	Reflection 4	**Reflection** 4	**Reflection** 5	**Reflection** 4,3
TAB	**Observation** 3	**Observation** 4	**Observation** 5	**Observation** 4,7
	Reflection 4	**Reflection** 5	**Reflection** 5	**Reflection** 4,7

The **TG /ILO** and its manner of presentation is summarised in Table 4-6. Since learners had no online access to the TG or rubric, the researcher awarded a 4. Alexis agreed with the researcher's observation because learners had less guidance on the lesson expectations. *("I feel there were children who were halfway with their project or assessment before I made the rubric available."). (FI6A).* While Alexis realised that she should have included the rubric, this would have interrupted her teach-talk pattern (i.e. to switch between teaching and learner interaction). *("I should have designed the rubric, but I so wanted it to be a continuous conversation between myself and them, that I worked incorrectly in the end."). (FI6A).* She maintained the 'teach-talk' pattern of interaction because she valued active learner engagement (FI1 and FI4A).

The lesson's **LA**, expressed as learner and teacher activities, is summarised in Table 4-6. According to Lily, the cooking activity was relevant to learners' daily lives and the videos were produced for a real audience (i.e. the peers as assessors) (OBS2 Alexis P). Alexis was impressed by the quality of learners' videos*. ("I think the quality of the little videos that the children made at the end of the day was very cute."). (FI6A).* She also indicated that learners gained a lot through the experience. *("They really learnt a lot to combine the PowerPoint videos and stuff."). (FI6A).*

The **ASM** for this lesson, including the type of assessment and the assessors, are summarised in Table 4-6. For Alexis, it was a new kind of assessment where learners performed their parts at home and then combined these using apps (FI6A). The rubric utilised an existing rubric template provided by David and included learners' suggested assessment criteria as well. Alexis managed to involve the learners, but the rubric was too general and did not focus on language use and learner confidence. *("I should have taken an existing prepared speech rubric and added a bit of things like full group participation; what could you improve?"). (FI6A).* Learners also did not consider the elements of the rubric critically, due to their age. *("To truthfully say, I think it would have worked better with an older group, but 14-year olds cannot… They simply agree when they tell you something." (Alexis – FI6A).* The peer assessment was valuable because it enabled learners to *"assess each other's videos and then also reflected on the video or assignment as a whole." (OBS2 Alexis S).*

The teacher observers awarded 4s for ASM because the rubric was not available from the start, but the researcher felt that they knew what was expected of them despite the lacking rubric. In terms of support, Alexis provided mere passive support to learners as she only responded to learners' specific questions. *("Yes, I must tick it (i.e. the criteria for Passive support) because honestly, I did not do a lot."). (Alexis - FI6A).* Lily indicated that no feedback was given to the class after the videos were peer-assessed and Alexis agreed with this. *("I did not, at all, afterwards have a discussion after the children assessed each other… highlighted positive things, highlighted negative things."). (Alexis – FI6A).* Both teacher observers also indicated that formative assessment was not seen in this lesson. *("It feels as if it was not continuous. They completed the project and then only was it assessed."). (Alexis – FI6A).*

The **RO** for this lesson is contained in Table 4-6. Alexis provided guidelines, instructions, and tips to learners but, according to all three observers, did not act as active facilitator (FI6A). *("I did not intentionally go from group to group to chat about their ideas or to give them ideas or advice."). (Alexis - FI6A).* Yet, during FI7 Alexis indicated that she was more of a facilitator during this lesson where she provided examples, guidance, and feedback to the learners. Alexis motivated her attitude towards active teacher. *("It is actually a personal thing, because I feel that kids look at us too much and then they become lazy to think for themselves."). (FI6A).*

In terms of learner roles, Alexis indicated that different learners assumed different roles with various levels of success. *("Look, I think some of the children owned it… So, I think some of the learners flourished, and other children (as it happens), simply waited for things to be done for them."). (FI6A).* Alexis believed that she managed to enable learners to change their roles to becoming peer-teachers. She also found that learners enjoyed their new roles (FI6A).

Alexis' *SAMR* level and tools used are included under **TAB** in Table 4-6. A big difference in initial scores occurred for TAB (i.e. 3, 4 and 5). Alexis changed her score from 3 to 4 because she realised how technology-dependent her lesson was (FI6A), but not to a 5, because she was not comfortable enough with technology yet. While Alexis felt that learners did not make use of online sources, Lily indicated that they did, therefore Lily changed her TAB score from 4 to a 5. *("It (the DDD observation sheet) doesn't specifically say that they had to use new online resources, so I think that was where my thought process was and I would like to change my score."). (FI6A).*

Based on scores of 4 and 5 for TAB, the *SAMR* level of Alexis' lesson was between *augmentation* and *redefinition*, leaning towards *redefinition.* For the level of technology integration, this lesson functioned at level 4, since a learner-centred activity that included both student and computer interaction was done, while collaboration and creativity were also key (Sandholtz et al., 1997). Learners had a choice in technology use in terms of apps used (Florida Center for Instructional Technology, 2020). This signifies a lesson design that functions at the *redefinition* level of the *SAMR*.

4.7.4.2 Alexis' constructive alignment

Table 4-38 answers three questions that analyse the alignment among lesson design elements.

Table 4-38. Alexis' constructive alignment in lesson 2

To what extent was the outcome met?	How were ASM and TG linked?	How were LA and TG linked?
The outcome was entirely met, because learners filmed and combined videos of high-quality that contained music, special effects, and learners' voices.	The peer-assessment assessed how well the learners collaborated and enabled learners to evaluate each other's work as well.	The teacher's supportive role and learners' making of group videos enabled learners to complete their prepared speeches.

The TG/ILO was reached through online collaboration and creation (RO and TAB), therefore the assessment (ASM) and teaching (LA) were relevant and well executed. All *DDD* elements scored 4 and higher on the observation sheets, therefore this lesson design was constructively well-aligned.

4.7.4.3 Alexis' surface and deep learning

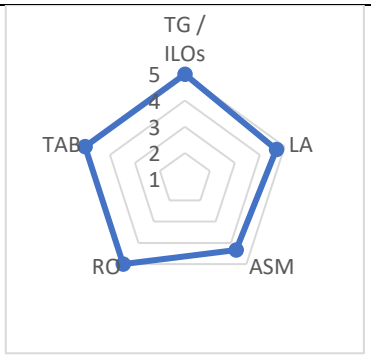
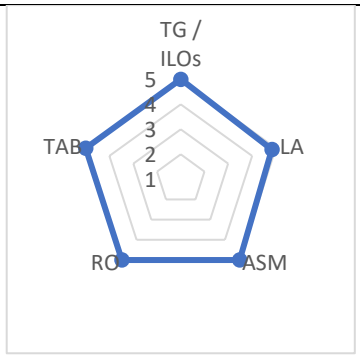
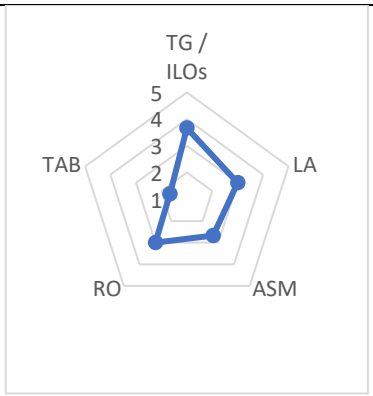
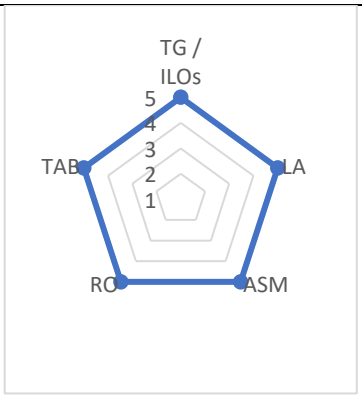
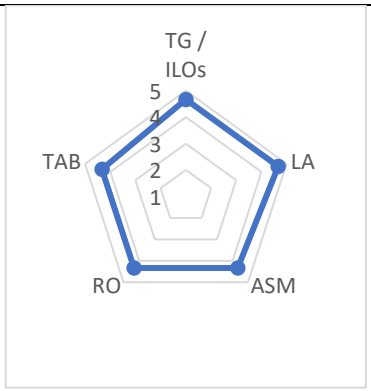
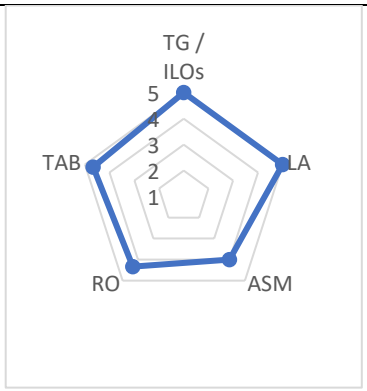
Table 4-39. Analysis of Alexis' surface and deep learning

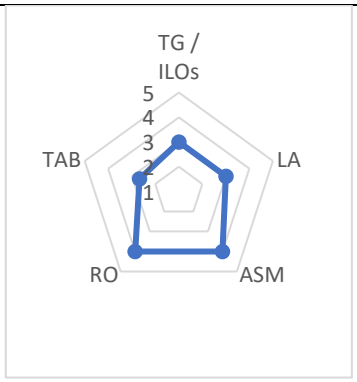
Data sources	OBS2 Alexis S, P and R; CAR2 Alexis V1
Lesson element	**Analysis**
Outcomes (TG/ILOs)	**Verbs from Bloom's taxonomy** **Activity prompt (CAR2 Alexis D1):** Learners *chose* a recipe, and every learner *performed* a part of the recipe. They *chose* and *used* different apps to *present* their orals (*created* videos) in groups. Afterwards, learners did peer-*assessment.* **Observation sheets:** Apply to create (OBS2 Alexis S), understand then analyse to create (OBS2 Alexis P) and apply to create (OBS2 Alexis R)
	Skills developed Technical skills: Used MS PowerPoint to make a combined video with effects.
Tablets (and other digital resources) (TAB)	**Manner of tool use** • Apps enabled learner video creation and display. • MS Teams enabled peer-assessment.
Learning activities (LA)	**Types of questions** • Prompts for learners to collaborate and produce videos while being creative • Learners evaluated their peers' work.
Assessment (ASM)	**Measurement of surface/deep learning** • Self-assessment on rubric: Individuals' contributions, what could be done differently and how collaboration could be more effective. • Peer assessment: Video design

Deep learning occurred *"because learners created their own products collaboratively." (OBS2 Alexis R).* Lily indicated the higher-order level of cognitive activities in the lesson: *"The learners had to understand the assignment and apply what they have learned to create new content using technology. They also evaluated their work by peer assessing." (OBS2 Alexis P).* Since Alexis' lesson functioned at the levels of application, analysis, and creating in a collaborative fashion as seen in Table 4-39, this lesson involved collaborative deep learning as described by Jahnke et al. (2014a).

4.8 Comparison of participants' digital didactical designs

Table 4-40. Comparison of participants' digital didactical designs

	Aspect	Lesson 1	Lesson 2
David	***DDD* radar chart**		
	***DDD* cluster**	A	A
	***SAMR* level**	*Redefinition*	*Redefinition*
Roy	***DDD* radar chart**		
	***DDD* cluster**	C	A
	***SAMR* level**	*Substitution*	*Redefinition*
Lily	***DDD* radar chart**		
	***DDD* cluster**	A	A
	***SAMR* level**	*Modification*	*Modification to redefinition*

	Aspect	Lesson 1	Lesson 2
Alexis	***DDD* radar chart**		
	***DDD* cluster**	B	A
	***SAMR* level**	*Augmentation*	*Redefinition*

Based on the radar charts and *DDD* clusters presented in Table 4-40, participants' designs, improved *DDD* elements, as well as changed *SAMR* levels are discussed.

4.8.1 Comparison of participants' digital didactical designs and clusters from lesson 1 to 2

In both lessons, David's TG/ILOs, TAB, and RO were well developed. While LA increased slightly from lesson 1 to 2, it was ASM that had the clearest improvement. The digital didactical design remained a Cluster A, but all elements were developed to be equally strong.

Among all the participants, Roy's digital didactical design changed the most from lesson 1 to 2. His TG was the strongest element in both lessons, but his TAB increased the most and very significantly. Owing to Roy's change in design approach for the second lesson, all his digital didactical design elements improved significantly, and he went from a cluster C to a cluster A design.

In Lily's lessons, the TG remained the strongest element and RO was constant. The LA, ASM, and TAB showed some improvements. While the cluster of the digital didactical design did not change from cluster A, the strength of the elements increased.

Alexis' ASM and RO remained constant and well-developed during both lessons, while the TG/ILO, LA, and TAB changed the most. The LA featured as the strongest, improved element. Alexis' second lesson's digital didactical design moved towards the outer sides of the radar chart, evolving into a truer digital didactical design. The cluster B became a cluster A design as well.

4.8.2 Exploration of changes in participants' digital didactical designs from lesson 1 to 2

In David's digital didactical design, LA and ASM improved the most and these were explored in OBS1 David S, FI4E, OBS2 David S, FI6E, and FI7. For his LA score of the first lesson David stated that all learners were not well-engaged, affecting the quality of deep learning. *("When I scored myself, I was just thinking of all the kids who were left out and that everyone did not receive the deep learning."). (FI4E).* During the second lesson, the researcher observed that some of the learners were distracted and David agreed. *("I raised my voice a few times to ask them to work." (FI6E).* According to David, however, his TAB and LA improved the most because he used the flipped classroom strategy and digital tools in new ways (FI7).

In terms of ASM, David reflected on his passive support to learners during lesson 1 (i.e. only when prompted by learners). Learners did also not submit their document to receive teacher feedback (FI4E). In lesson 2, however, he incorporated online group-based peer-assessment that addressed level 5 ASM descriptors. While ASM improved the most in David's lessons, this was also the more challenging *DDD* element to include.

Roy's changed lesson designs were explored in FI6E and FI7. Roy indicated that his lesson designs changed to include variety in lesson presentation style, as well as improved learner engagement: *("So, I felt that they needed to do something fresh that was a bit more engaging."). (FI6E).* Roy and David also agreed that poetry lessons (used for Roy's second lesson) often provide more opportunity for interactive, creative lessons. The type of lesson and its influence on technology use is an important consideration for all participants from the start. *("With poetry, it is more repetition of concepts that they already know, but also it is an aspect where they are thinking more about themes and stuff like that; whereas language is more of something that they need to learn and apply. And there is a restriction on the sort of imagination that they need to use in that sort of aspect." (Roy – FI6E).* During FI7, Roy agreed that his TAB improved the most, but that this did not guarantee an improvement in his teaching as well.

At the start of the study (FI2), Roy indicated that he would present a variety of lessons for the study based on the material he was covering during the period set aside for

lesson observations. Since he also valued high quality lessons (whether teacher-centred / traditional or technology-based), he chose the lessons best suited for his purpose. For lesson 1, the best way to transfer language knowledge was by way of explanation, while poetry was more easily done in a collaborative fashion during the second lesson.

Lily's LA, ASM and TAB that improved were explored in FI4A, FI6A, and FI7. For LA, Alexis indicated that Lily managed to allocate a variety of roles to her learners during lesson 1 (i.e. homework; working with a group; feedback) (FI4A). While lesson 1 involved learners designing videos in preparation for a test, Lily's self-observed score was influenced by her unwillingness to award too high scores for herself. *("I feel one can always (I can) always do a bit better."). (FI4A).* For lesson 2, Lily scored a 5 all round, because learners created *Powtoons* to showcase their understanding of the film.

For ASM during Lily's first lesson, learners made videos at home. The absence of formative teacher feedback decreased the LA scores. The task was also not assessed for marks, a downfall that influenced Lily's self-observer score. In lesson 2, still no teacher formative feedback was recorded, and the assessment remained summative rather than formative. *("They first had to finish the product and then it was marked." (Lily – FI6A).* Yet, the inclusion of peer assessment changed the type of assessment done, thereby increasing the ASM score.

Lily's use of TAB in lesson 1 was criticized by Alexis because a wide variety of apps were not used. Lily agreed that the more apps were used, the better, since such practice removed teachers from their comfort zones*. "I think, the more apps you use, the better." (FI4A).* In lesson 2, the observers' focus was on how the technologies were used. The use of *Powtoon* to do film reviews created new assignments using technology, yet the lack of collaborative work still influenced Lily's TAB score. Without Covid-19 influencing teachers' practices, Lily would have preferred to do this as a group assignment, and this would have increased her TAB score to a 5. During the reflection, Lily indicated that her TAB improved the most during the study, specifically because she started using things that she had not used before.

The TG/ILOs, LA, and TAB improved in Alexis' lessons (with LA improving the most). These improvements were explored in OBS1 Alexis, FI4A, OBS2 Alexis, FI6A ,and

FI7. During lesson 1, the TG was not available electronically and Alexis did not spend enough time explaining what exactly the TG entailed. *("I should have spent five or 10 minutes to properly explain to them what I wanted – given a bit more content and knowledge that they could go home with."). (FI4A).* During lesson 2, Alexis presented the TG orally as well as on her PowerPoint (OBS2 Alexis), thereby receiving higher TG scores. In both lessons, however, the TG focused on the development of knowledge and skills.

The observed LA of lesson 1 involved individual learners designing quiz questions on language rules without using digital tools themselves. Learners were less engaged while the teacher set up the quiz in class. For lesson 2, however, the LA score improved significantly because learners were engaged in design, collaboration, and peer reflection (OBS2 Alexis). During FI7, Alexis indicated that her LA (and TAB) improved the most during the study because from lesson 1 to 2 she left the entire assignment and assessment process up to learners, activating them to be active in all the lesson aspects (with some guidance, of course).

Alexis' TAB score changed because of a change in observation focus. During the first lesson, Lily and Alexis required a large variety of new digital tools. Since either a small number of tools or no new tools were used, they awarded lower scores, but Alexis realised that TAB was about quality over quantity (FI4A). During the observation of the second lesson, the focus moved to *how* the digital tools were used. Alexis' lesson aspects were technology-dependent (i.e. improved TAB score), although the tasks were not completely new (OBS2 Alexis). Alexis indicated that her TAB had improved the most (FI7).

4.8.3 Participants changing *SAMR* levels compared before and during the lesson presentations

After presenting two lessons, participants reflected on how their *SAMR* levels developed from the start to the end of the study. These developments are summarised in Figure 4-8, where 1 refers to *substitution*; 2 to *augmentation*; 3 to *modification* and 4 to *redefinition*. Participants' *SAMR* levels for the two lessons are presented in Table 4-40.

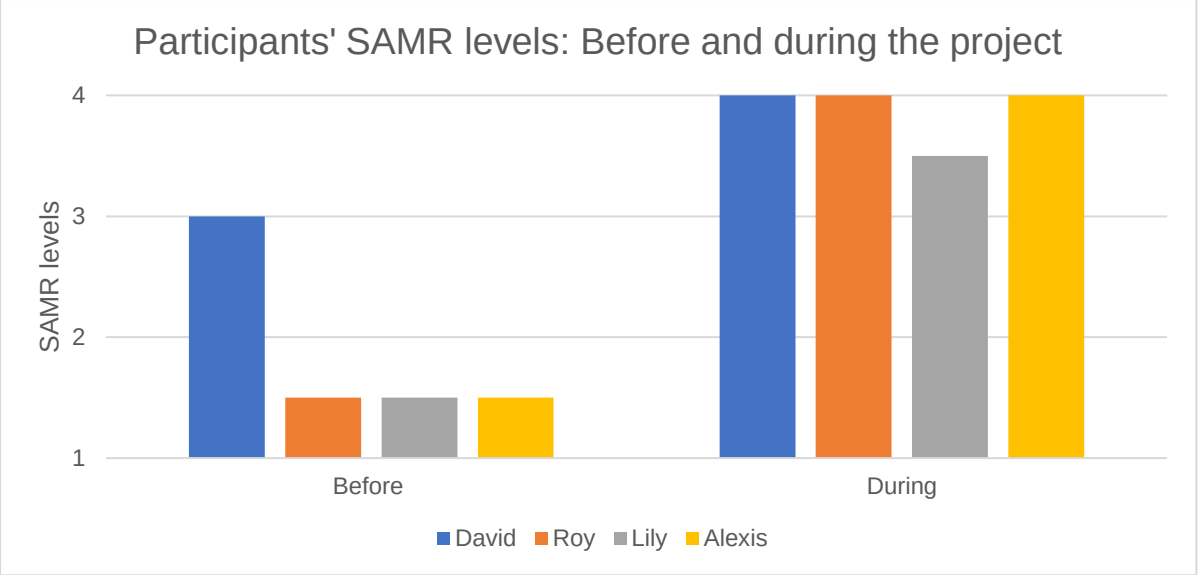


Figure 4-8. Participants' *SAMR* levels before and during the study

David moved from a *modification* level at the start of the study to *redefinition* practices based on a changed approach towards the use of technology in his teaching approach (FI7). Roy went from *substitution/augmentation* to *redefinition*. He defined his *redefinition* level as *"I went there" (FI7),* implying that he went all to way in terms of technology integration. He demonstrated transformed practice using technology, but indicated that *"it's not my ideal; it's the ideal of technological academic study." (FI7).* He mentioned that he had replaced his daily reality (as in lesson 1) with the elements of *DDD*, mainly for the sake of the study. Lily went from *substitution/augmentation* to *modification and redefinition*. She indicated that "*certain elements of my lesson were modification and certain elements were redefinition." (FI7).* Alexis stated that her teaching practice had been altered from *substitution* to *augmentation* to *redefinition* because she employed technology and the flipped classroom strategy more. This created active learning opportunities.

4.8.4 Comparison of elements among participants

In lesson 2, all participants progressed to cluster A digital didactical designs, while David and Lily had cluster A designs in both lessons. While clusters A to C were well defined, differences occurred in how participants included the different elements of *DDD*. Some of the differences could be seen in the presentation of outcomes, the type of teaching activities, as well as the teaching strategies used. David and Alexis prepared activity prompts for lessons 1 and 2, a practice that Roy also used for his

second lesson. Alexis and Roy preferred oral TG presentation, but managed to display their goals during their second lessons as well.

David and Lily preferred to replace teacher explanations with YouTube tutorials, while David and Alexis did the explanations themselves. Other teaching strategies like the flipped classroom strategy featured prominently because David advocated for it at the start of the study. The other three participants followed in David's footsteps, although the use of the strategy differed from David's original understanding, as influenced by the researcher's definition of the strategy. In general, the participants employed active learning strategies (i.e. learner-centred teaching strategies) and allowed learners to construct their own meanings.

4.9 Exploring participants' experiences of using the *DDD* observation sheet

Since this study placed the *DDD* observation instrument, a typical research instrument, in the hands of participants, their experiences were documented. The codes that emerged into categories and finally into the theme of *Participants' experiences of using the DDD observation sheet* are indicated in Figure 3-12.

4.9.1 Participants interpretations of the *DDD* elements

Participants interpreted the *DDD* elements differently while using the *DDD* observation sheet. These interpretations were coded under the category of 'Participant interpretations of *DDD* elements' in Figure 3-12. The coded data are provided in Table 4-41. The variety of participants' interpretations influenced their lesson observation scores, especially during lesson 1. These varied interpretations were discussed and negotiated among participants and the researcher to reach consensus on the meanings of terms and/or level descriptors.

Table 4-41. Participant interpretations of *DDD* elements

DDD element	Description	Misconception	Participants
TG/ILOs	**General** Observers' scores had to be based on digital presentation of the TG/ILOs and not on goal attainment.	Observers scored the extent of outcome attainment and the cognitive level, not the TG/ILOs presentation to learners.	FI4A - Alexis
	Observation sheet criteria *Co-aims of students are included*	These aims must be written down vs constructed during the lesson.	FI4A - Lily
LA	Meaning of surface and deep learning	Surface learning interpreted as *surfaces* that learners interacted with i.e. "Working together / decision making / technology-based assessment / editing / assessing and reflecting."	OBS2 Alexis S
ASM	**General** Digital assessment	Uncertainty about the necessity for digital assessment.	FI4E – Roy and David
	Observation sheet criteria Formative feedback vs assessment	Formative feedback is simply feedback; only testing and marks counted as assessment.	FI4E – Roy
	Observation sheet criteria *A plan exists for how the teacher creates pro-assessment or formative evaluation.*	The assessment plan had to include formal assessment.	FI6E - David
RO	**Observation sheet criteria** *Teacher supports the student reflection of roles and development of new roles.*	Criterium not understood	FI6A - Alexis
TAB	**General** Digital tools used influenced the score.	• The more digital tools used, the higher the score. • New tools had to be used to obtain a higher score.	FI4A - Lily and Alexis
	Observation sheet criteria *Students use online sources.*	Apps are considered online sources vs iPhones have built-in apps (i.e. not online sources).	FI6A – Lily vs FI6A – Alexis
Other aspects	Observation sheet used for lesson 1	Uncertainty about comments required in comments section.	FI4 - Lily and Roy

4.9.2 Participants' use of the *DDD* observation sheet

According to all participants (FI4), the *DDD* observation sheet required an observation from the perspective of how digital tools are used to enable every lesson element contained in *DDD*. Participants shared other experiences of working with the observation sheet. These codes, under the category of 'Use of the *DDD* observation sheet', were coded as presented in Figure 3-12. The detailed data are tabulated in Table 4-42.

Table 4-42. Participants' experiences of using the *DDD* observation sheet

Code	Details	Participants
Not all parts are relevant	• Some of the criteria combined more than one aspect per criterium. Participants did not tick the criterium if all parts were not relevant. • If criterium was not understood, it was not marked	FI6A – Alexis and FI7 - Roy and David FI6A - Lily
Working too quickly / without attention	• Improper reading • Worked too quickly and without full attention. • Lack of time: Rushed	FI6A – Lily FI6A – Alexis and FI7 – David FI7 - David
Assistance with lesson design	• Observation sheet guided lesson planning. • Observation sheet not used for lesson planning. • David tried to fulfil the criteria on the observation sheet. • Planning guided by SAMR levels.	FI7 - Lily FI7 – David, Roy, and Alexis FI7 – Roy FI3 - Alexis
Scoring using OBS	• Stricter with self-observations • Unintimidating • Unrealistic • Holistic vs detailed scoring	FI4A – Lily and FI4E – David FI7 – Lily FI7 – Roy FI7 - Roy
Difficult elements to assess	• Peer-assessment using digital tools • Repetitive elements on the observation sheet	FI7 – David, Lily, and Alexis FI7 – David, Lily, and Alexis
Prescriptive	• Observation sheet was very prescriptive. • Less objective	FI4E and FI7 – Roy FI7 - Lily

In terms of the observation sheets' **assistance with lesson design**, the researcher assumed that participants would use the *DDD* observation sheet as lesson planning guideline, but only Lily did this. David kept the elements in the back of his mind, while Alexis' first lesson design was influenced by an attempt to improve her *SAMR* level. *("I'm actually looking for ideas to incorporate level 3 and 4 because I feel like my lesson is very level 1 and 2."). (Alexis - FI3).* Roy and Lily indicated that they kept to their normal practices and added digital tools for the purpose of the study (FI7).

The **scoring of lessons using the *DDD* observation sheet** saw participants, especially David and Lily, be stricter with their self-observations (FI7), because they felt that there was always room for improvement. *("I think in your own class there is always room for improvement, so if I gave myself a 5, where would I go next?"). (David - FI4E).* David felt insecure about his first lesson and was nervous while scoring (FI4E). The peer observations, on the other hand, were unintimidating because CoP members

knew each other well and observed lessons through a digital tool usage lens and not to criticise their colleagues on a personal level.

Roy shared two of his experiences. Firstly, he found the observations with the observation sheets unrealistic, because they set up the participants to perform to meet the set standard. *("I think it's unrealistic. I think…when you give us the criteria, everyone's going to try and meet that criteria and once we've met them, everyone gets 5s. So, that is the base: If you give us what you want, then we meet it…"). (FI7).* Secondly, Roy did not use the observation sheet as an exact guide, but rather observed and scored lessons holistically. *("I found that once someone had done a specific kind of lesson, they fulfilled the goals of the various things, and I could organically go through them and say Yes, that was completed without thinking whether they had completed it."). (FI7).* The difference in approach is best seen in the example in Figure 4-9 and Figure 4-10. Roy observed and scored holistically with short comments, while Lily would discuss every *DDD* element in detail.

Fill-in semi-structured observation sheet for *Digital Didactical Design*		
Date of observation	2020-07-17	
Subject and grade of lesson	GR 10 ENGLISH	
Topic of lesson	LANGUAGE	
Observer	Self (Roy)	
DDD elements	**Score (1 - 5)**	**Comments / Descriptions**
Teaching goals / Intended Learning Outcomes	4	LANGUAGE SKILLS
Learning activities	3	LANGUAGE SKILLS
Assessment	2	No assessment at the time but planning for the future
Social relations	4	Interaction between learners establishing baseline learning
Web-enabled technologies	2	Online learning

Figure 4-9. Roy's holistic self-observation sheet of his first lesson

Fill-in semi-structured observation sheet for *Digital Didactical Design*		
Date of observation	16-Jul-20	
Subject and grade of lesson	Afrikaans First Adfditional language - Grade 9	
Topic of lesson	Revision of our set reading work - Permamente Ink	
Observer	Myself - Lily	
DDD elements	**Score (1 - 5)**	**Comments / Descriptions**
Teaching goals / Intended Learning Outcomes	4	• To recap the content of our book, Permanente Ink. • To complete our first assessment on the book.
Learning activities	4	• Trying to focus on deep, meaningful learning with active, collaborative, authentic, goal-directed, and reflective content, while using the Flipped Classroom teaching method. • Learners have to work in a group (active and collaborative learning) to create a summary of their reading book (authentic, because it is their own work; goal-directed and reflecting on the content of the book). The summary of their book has to filmed on Flipgrid (students produce something, engaged classrooms, collaboration with peers, students produce with internet assistance and other resources from outside the school). We will then watch the video's in class (a real audience; students critically reflect on existing content) and then write an online quiz (relate knowledge to new knowledge).
Assessment	4	• Assessment will take place in class as an online, self-marking quiz. The student can see their results immediately after writing and submitting the test. • When all the learners wrote the assessment, we will discuss the memo in class. Most likely on Monday, 20 June.

Figure 4-10. Lily's detailed self-observation sheet of her first lesson

The **difficult elements to assess**, according to David, Lily, and Alexis, were found in the repetitiveness of the element criteria. *("Like if your TG was to do a PowerPoint, that was also the learners' goals: to use PowerPoint to do the assignment. So, I sometimes felt when I did the Excel rubric: 'Can I say this again, because I said it previously? The answer sounds right for these questions as well'." (Alexis - FI7).* Lily agreed with Alexis and found TG, LA, and ASM to be repetitive, while TAB was included in all elements of *DDD*.

4.9.3 Participants' inputs on the design of the *DDD* observation chart

Another aspect of participants' experiences of using the *DDD* observation sheet relates to the design of the observation sheet. After the first cycle of lesson presentations, the researcher explored how learning content and pedagogical practices (i.e. didactics) were included on the *DDD* observation sheet. The researcher used these insights and participants' inputs (FI4) on possible adjustments to the observation sheet, to alter the sheet for the second cycle.

4.9.3.1 Alterations to the DDD observation sheet and implementation for teacher participants' use

While the researcher did not add more elements to the observation sheet, participants' recommendations for improvements on the observation sheet were collected during FI4 as represented in Table 4-43.

Table 4-43. Suggested additional elements for the *DDD* observation sheet

Element	Contributor	Motivation	Included in updated sheet
Lesson time frame	Alexis	Fast-paced lessons with a 'teaching-doing' pattern to increase engagement.	x
Subject-specific content	Lily	Level descriptors for language lessons, although the 5 generic *DDD* element descriptions are sufficient.	x
Format of the observation sheet	Lily David	• MS Excel lacks a spell-check function. • Use a Google Form instead. • Provide criteria that users can select.	x x ✔
Didactics / teaching style	David	Include criteria that observe how well the teaching went to get the lesson content across.	x
Active teaching/learning strategies	Roy	Indicate the learning/teaching strategy used.	✔
Technology access	David	Without proper technology access, *DDD* scores will immediately be lower.	x
Scoring	Roy	Provide only a level 5 descriptor with scores from 1 – 100 instead of 1 – 5	✔ (Partially)

The researcher selected the most relevant recommendations to design a second, updated observation sheet for the second cycle of lesson observations. Recommendations that were implemented are ticked in Table 4-43. All other alterations are included in Table 4-44. Three questions were added on constructive alignment (in TG/ILOs, LA, and ASM) and the TAB level descriptors were altered. Additional questions were added to most elements.

Table 4-44. Changes in the *DDD* observation sheet from CAR cycle 1 to 2

Element	Cycle 1	Cycle 2
General presentation	**Document type** One-page MS Excel sheet with automatically-created radar chart. **Level descriptors** Separate document **Space for general comments**	**Document type** MS Excel sheet with six different tabs (one per *DDD* element and one for the radar chart) **Level descriptors** Individual sentences with tick boxes on MS Excel sheet **Space for general comments** Specific questions also added.
TG/ILOs	**Cycle 2** **Two questions added.** • Provide the lesson outcome. • To what extent was the outcome met? Explain.	
LA	**Cycle 2** **Six questions added.** *General observational purposes* • Describe the learner activities. • Describe the teacher activities. • Name the teaching strategy. • Explain how the teacher uses technology to teach. *Constructive alignment* • How are LA and TG linked? *Surface and deep learning* • At what level of Bloom's taxonomy did learners function? • Was this surface or deep learning? Explain.	
ASM	**Cycle 2** *General observational purposes* • Describe the assessment. *Constructive alignment* • How are ASM and TG linked?	
RO	**Cycle 2** *General observational purposes* • List the teachers' roles. • List the learners' roles.	
TAB	**Cycle 2** *Constructive alignment* • Explain how the technology supports the teaching. *Level descriptors changed.* • SAMR level descriptors were moved to the end of levels 1, 3, and 5 to keep the layout consistent. • The extent of web-enabled technology use was separated from the SAMR descriptors in levels 1, 3, and 5. • The description of level 3 (medium extent of technology use) was too narrow for teachers' use. Based on *TIM*'s level descriptors of collaborative learning, *DDD*'s level 3 was aligned to *TIM*'s *adoption/adaptation* level to include collaborative use of tools in both traditional and limited new ways.	

4.9.3.2 Recommendations about the use of the DDD observation sheet after the second lesson

During FI7, the participants reflected on the updated design of the observation sheet, and some final recommendations were made. These final recommendations were coded in the category 'Design of the *DDD* observation sheet*'* in Figure 3-12.

Oral use

For the lesson 2 observations, Roy did not use the updated *DDD* observation sheet, therefore the researcher went through the updated sheet orally during the reflection session (FI6A). Every criterium was read, ticked when applicable, and his answers recorded. He found the oral discussion much easier. Lily indicated that the use of the observation sheet was a highly academic exercise, while the reflection sessions were more natural. *("It felt more in line with what we do everyday as teachers - discussing our work."). (FI7).* Alexis supported Roy and Lily's views. *("I feel like if you would have asked me verbally and explained the questions, my answers and scores would have been totally different."). (FI7).* She added the following: *"I benefitted more from our meeting afterwards than by actually sitting and looking at the Excel spreadsheet and doing it myself. Maybe I'm just more verbal and visual."). (FI7).*

Design of OBS

As indicated, the researcher updated the observation sheet for use in lesson 2. Lily found the separated, clickable criteria per element more user-friendly. On the other hand, David indicated that MS Excel was not as user-friendly as Google Forms and was overwhelmed by the amount of information contained on the sheet. David found the sheet to be not interactive enough (FI7). The feeling of being overwhelmed arose because more sections needed addressing on the second sheet. *("I feel very overwhelmed, specifically with the move from the first one to the second one. There were even more things that I need to consider now." (FI7).*

Roy indicated that the language use of the observation sheet made it difficult to use and understand. *("I couldn't read it, and I didn't think it really resonated with me"). (FI7).* Alexis agreed by stating that the words used were complicated and could have been more relatable and easier to understand.

During FI7, participants had the opportunity to indicate whether there were elements lacking from the observation sheet, but no participants had any contributions to make.

4.10 The value of teaching with tablets, MS Teams and *DDD* during the study

The value of the study and its use of MS Teams, tablets, and *DDD* can be seen in the benefits for both teaching and learning. The study's value for teaching and learning was coded and categorised before arriving at two themes: 'The study's value for teaching' (Figure 3-10) and 'The study's value for learning' (Figure 3-11).

4.10.1 The study's value for teaching

In terms of **technical skills,** David, Lily, and Alexis improved their skills during the study (FI7). David experienced a different side to digital tools. Through her digital tool exploration and increased use, Lily felt less intimidated to incorporate these tools into her daily classroom practice. *("I've used technology so much more in my class because of this project, and I think it has become more of a daily use for me since we started this project."). (FI7).*

In contrast, Roy found that his learners' technical skillsets, rather than his own, developed during the study. At the start of the study (FI1), Roy stated that his own command of digital tools needed to precede learners' tool usage. Yet, his learners designed narrated PowerPoints during his second lesson regardless of his own PowerPoint skillset. *("Just because I tell them which platforms to use, it does not necessarily mean that I can use those platforms." (FI6E).*

While three participants' technical skills improved, all of them could continue with their normal teaching practices while **incorporating technology** for the study's sake (FI7). The same lesson goals were reached, but now by using technology as well. *("If you look at the goal, it was the same. I maybe just have reached the goal in a different way using technology."). (Roy - FI7).* The use of technology, however, was also necessitated by the online teaching and learning requirement during Covid-19.

The **way in which tools are used** was significant during the study. Alexis realised that it was not the number of tools used, but rather *how* these were used that mattered. *("It is not necessarily about the amount of technology that you use, but about how you use it, even if it is only one form."). (FI6A).* Based on her realisation, Alexis used PowerPoint (a familiar tool) to elicit learner creativity. Roy employed tools that enabled online task completion and peer-assessment.

At the start of the study, a wide spectrum of **possible apps** was identified. Roy identified a variety of online apps that were used for teaching and learning. While learners were bored by teachers' PowerPoints (Roy - FI1), they now had the opportunity to use apps and tools that were usually used by teachers and professionals only. *("We used a lot of facilities that they haven't actually used."). (FI7 - Roy).* Alexis discovered the value of an MS Teams quiz and would use it in future as well (FI4A). David pointed out learners' ability to identify additional apps (i.e. not specified by the teacher). In turn, he was also introduced to new apps (FI7).

The study and *DDD*'s impact can be seen in its influence on participants' pedagogy**,** as well as a variety of other aspects. The **influence on pedagogy** is indicated in Table 4-45 and stretches across various *DDD* elements. These impacts will influence participants' future pedagogy as well, as described during FI7.

Table 4-45. The influence of *DDD* and the study on participants' pedagogies

Participant	*DDD* element	Activity	Future pedagogy
Alexis	LA	Group videos for orals	Use for other grades as well
	TAB	Less printed notes	Technology made life easier and quicker.
Lily	LA	Use of flipped classroom strategy	Now used in most classes.
	TG/ILOs	Design creative lesson goals	Repeated in future.
David	RO	Increased teacher-learner interactivity	Provide frequent technical assistance.
	LA	Different use of flipped classroom strategy	("I think the homework section really helps, so I'm going to incorporate it.") (FI3).

The other various aspects that *DDD* and the study impacted are seen in the category of *Changes in lessons* in Figure 3-10 based on FI4 and FI6. These impacts are represented in Table 4-46.

Table 4-46. Changes to lessons with *DDD*

Code	Description	Participant(s)
Variety	*Powtoons* enabled an alternative method for doing film reviews.	FI6A - Lily
	From teacher-centred chalk-and-talk lesson 1 to authentic, technology-dependent lesson 2 *("So, I felt that they needed to do something fresh that was a bit more engaging so that we could have done it.")*	FI6E - Roy
Type of lesson	Alexis' interactive language lesson incorporating digital tools	FI4A - Lily
	Planned language lesson with digital tools	FI7 - Roy
	Active and collaborative poetry lesson *("I think certain aspects of English lend themselves more to different learning activities.")*	FI6E - Roy
	Deep learning with the flipped classroom strategy entailed a 1-2-3-4-5 process. This involved 1 – Learners went to do the research; 2 – Learners returned and teacher requested feedback; 3 - Teacher provided feedback; 4 - Learners completed the work; 5 - Learners marked each other's work. (FI6)	FI6A - Alexis
Learner involvement	Alexis' first lesson left struggling learners behind.	FI4A - Lily
	Poor Wi-Fi connectivity hindered deep learning for all learners.	FI4E - David
	Peer-assessment collected learner inputs.	FI6A - Lily
Learner enjoyment	Video-making by learners *("Everyone was quite (like I said) enthusiastic to complete the assessment."). (David - FI6E)*	FI6 – Lily, Alexis, and David
	wheeldecide.com for group division *("I don't know why, but they get very enthusiastic seeing their own name written, not realising that everyone in the class is going to eventually see their name.")*	FI6E - Roy
	Learners enjoy showcasing their work to each other. *("Most groups were so excited to do it and to share it with the class."). (Alexis - FI6A)*	FI6 – Alexis and Roy
Learners' quality of work	High quality of learners' PowerPoint videos	FI6A - Alexis
Teaching style	YouTube tutorials explained concepts in less time.	FI6A - Lily
	Inactive teacher when using the flipped classroom strategy. *("Laziness, basically because I didn't have to do much.")*	FI6E - Roy

DDD and the study could have a potential **influence on teaching in the long run.** This influence is divided into three levels as presented in Figure 4-11.

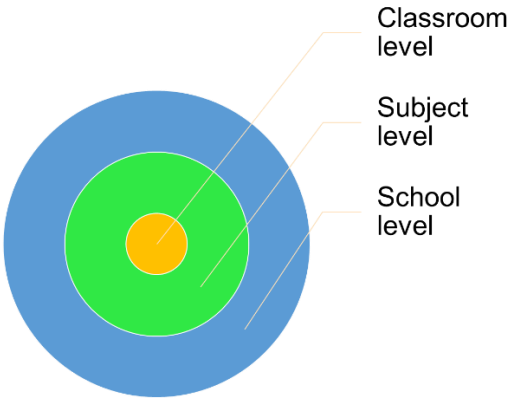


Figure 4-11. *DDD*'s levels of relevance

At the broadest **school-wide level** (i.e. the general South African educational setting), *DDD* is impractical due to its reliance on digital technologies. *DDD* is, however, relevant for well-resourced schools such as this study's target school (FI7 - Lily). David and Alexis supported this notion (FI7).

At a **subject-level**, Roy's notion of the relevance of *DDD* in all subjects (FI1) resurfaced during FI7. He found the collaborative nature of *DDD* highly relevant for language classrooms, but still doubted whether other subjects would find it as relevant.

At a **classroom level**, Roy believed that the subject and the type of teacher influenced the level of relevance (FI7). This study offered participants an appreciation of the potential of successful technology-integrated lessons. Lily, supported by Alexis, indicated that one or two assessments per term could be done in a true digital didactical design fashion (FI7) due to time constraints. *("We know what proper technology lessons (or whatever the lesson) will look like, we just do not do it all of the time because we do not have time."). (Alexis – FI7).*

While all participants acknowledged the influence of *DDD* and the study on their lesson designs and pedagogies in Table 4-45 and Table 4-46, Roy indicated that the **lasting impact** of *DDD* and the study was limited because of the unrealistic lesson observations. He mentioned that he had simply fulfilled the study's expectations and would continue with his normal practice afterwards. *("I don't know if it has any long-term input into our lives. So, you have given us what we needed to do; we've given it to you; and then we scored ourselves. We have met the criteria."). (FI7).*

4.10.2 The study's value for learning

Just as *DDD* and the study benefitted participants to some extent, learners also gained a variety of aspects while engaging with participants' digital didactical design lessons. Roy felt unsure about the amount of learning that occurred due to technology use as indicated in Table 4-47.

Table 4-47. Learners' gains from the study and *DDD*

Code	Description	Participant(s)
Improved technical skills	Enabled younger learners to collaborate through teacher technical assistance.	FI4E - David
	A new skill was gained by making *Powtoon* videos.	FI6A - Lily
	Showcased technical skills when making narrated MS PowerPoints.	FI6E - Roy
	MS PowerPoint skills could be transferred to other tasks that require presentation as well.	FI6E - Roy
Learners as designers	Consider content and design. *("They have to grasp the content before they can apply it and analyse it as a designer.")*	FI6E - David
	Deep learning occurs while designing. *("I think dealing with the material in a different way allowed it to be retained in a much more deeper way (David agrees) and not just cut the surface of things. Because as you are busy (staring at the work; working with it), it sinks in at a deeper level.")*	FIE -Roy
	Group members that combined video segments in PowerPoint acted as designers.	FI6A - Alexis
"Educate themselves"	YouTube tutorials provided learners with skills for the future without teacher presence.	FI6A - Lily
Authentic and personal	Learner PowerPoints showcased their personalities. *("For me, it was that the children brought in their personalities into the video a bit. There was a bit of a dance, and they made jokes, and the music.")*	FI6A - Alexis
	Learners changed *Powtoon* templates to suit their personal taste. *("The majority of them tried to see how they could change it; how they could leave their own stamp on it.")*	FI6A - Lily
Amount of learning with technology	A variety of digital tools were used, but the amount of learning facilitated by technology was unclear. *("The lesson we did was quite an amalgamation of different elements. It was something slightly different, but I am not sure specifically if the kids learnt more or less or different elements. I can't really quantify that.")*	FI6E - Roy

David emphasised the importance of developing learners' 21st century skills during FI1. Participants indicated where learners managed to develop these skills and where these skills were still lacking as showcased in Table 4-48.

Table 4-48. Learners' developed and under-developed 21st century skills

Code	Description	Participant(s)
Skills in general	Challenged learners to think differently by using digital tools.	FI7 - David
	Used digital tools to actively involve and interest learners.	FI2 - Lily
	Use of these tools equipped learners with skills; more than simple content knowledge.	FI4E - Roy
	Teaching needs to prepare learners for life in the digital age, therefore it had to transcend a content-based focus.	FI1 - Lily
	The lessons developed learners' ability to create, communicate, collaborate, and think critically, but all the skills were not included in every lesson.	FI7 – Lily and Alexis
Creativity	Learner videos or PowerPoints showcased creativity.	FI6 – All
Collaboration	Online collaboration provided proof to the teacher and caters for group work under social distancing circumstances.	FI6E - Roy
	Learners collaborated to combine their individual PowerPoint video segments.	FI7 - Alexis
	Younger learners did not enjoy frequent exposure to online collaboration opportunities.	FI4E - David
Communication	Interpersonal communication skills were not well-developed through digital tools. *("Interpersonal skills (talking to other people and knowing how to have empathy with other people) cannot be taught online. So, I think there are lots of skills that kids learn while they are in class."). (Lily - FI1)*	FI1 – Lily and FI7 - Roy
	The MS Teams' chat function allowed even shy learners to speak up.	FI1 - David
Critical thinking	**Development of critical thinking**	
	Learners thought critically about language rules before designing higher-order quiz questions.	FI7 - Alexis
	Alexis' learners reflected on their own work before submission.	FI7 - Lily
	Learners voiced their opinions in language classrooms.	FI7 - David
	Learner reflection (i.e. critical thinking) was best developed through conversation.	FI7 - Alexis
	Peer-assessment made learners realise how difficult it is to regard someone else's work objectively.	FI6E - Roy
	Lack of critical thinking	
	Younger learners lacked critical thinking during assessment criteria design.	FI6A - Alexis
	The lacking ability to distinguish between high and poor quality of work during peer-assessment required teacher moderation.	FI6A - Alexis
	Not all learners could summarise information using MS PowerPoint. *("I felt that they wanted to say every single thing that was on the PowerPoint and it was almost cluttered.")*	FI6E - David
	Learners used internet information without making it their own.	FI2 and FI7 - Roy

All participants managed to create opportunities for learners' creative expression. Collaboration was another successful element seen in most lessons. Aligned to collaboration, frequent teacher-learner and learner-learner communication occurred,

even though participants' views differed on the potential of digital tools to develop communication skills. Critical thinking saw instances of success and failure.

4.11 The work and influence of the CoP in the study's TPD

The CoP influenced the entire study. The influences included in Table 4-49 varied from general and technical support, to the sharing of ideas and inspiration. Participants assisted each other with the understanding of the *DDD* elements and most found these interactions valuable and enjoyable. The codes used for the category 'Influences of the CoP during the study' are included in Figure 3-13.

Table 4-49. The influences of the CoP during the study

Code	At the start of the study	Participant(s)
Technical support	Normal interactive conversations about technology and doing things differently with David were more beneficial than the CoP (i.e. normal practice for Roy and David).	FI2 and FI7 - Roy
	David assisted with app setup (i.e. OneNote – Roy; MS Forms - Alexis and Flipgrid – Lily). *("I think David helped me with that form because I was having problems with trying to fully get it to work."). (Roy - FI6E)*	FI7 – Roy, Lily and Alexis
	David was always willing to help. *("Alexis, if you need any help, I am back again tomorrow then I will help you with something if you need me to help you with something.")*	FI3 - David
Ideas	Start of study: David's digital tool use was the ideal to attain for others.	FI1 – Lily and Alexis
	Participants benefitted from the sharing of variety of perspectives.	FI2 - David
	Different personalities could learn from each other. *("Just like we as teachers also learnt from each other in these lessons... So, by asking 'Oh, but what are you doing?' and 'How did you do that?', I definitely learnt from Alexis, Roy, and David."). (Lily - FI6A)*	FI2 – Lily FI6A - Lily
	Gathered ideas from each other. *("It was good to speak to them about their ideas, because it helped me with my ideas.") (David – FI7)* *("When I steal a little bit of their ideas (but steal in a good way), but then adapting it to what I can do in my class and in my subject.") (Lily – FI7)* Similar ideas • Lesson 1 -David and Lily used the flipped classroom strategy. -Alexis used a quiz like Lily. • Lesson 2 -All four participants used learner videos.	FI7 – David and Lily FI3 – Lily FI3 – Alexis OBS2
	Learnt about *Powtoons* while observing Lily's second lesson.	FI6A - Alexis

Code	At the start of the study	Participant(s)
Inspiration	How to use tools. *("What to use, how to use it, and when to use it"). (Alexis - FI2)*	FI2 – Alexis and Lily
Understanding of *DDD* concepts	Explanation of 'evaluation' by Lily helped Alexis to understand the term. *("Ok…peer-assessment, I thought so, yes. Yes, because when Lily explained it to me now…")*	FI6A - Alexis
Impact of reflections	Appreciated own lesson more. *("When we are now discussing my lesson the whole time, I realise 'OK, it was actually…' (and especially my own explanation) that 'it was actually quite a technology-based lesson'.")*	FI6A - Alexis
	DDD element criteria ticked after reflective discussion.	FI4 and FI6: David, Lily, Alexis, and researcher
	Learnt from feedback during reflections. *("When we had meetings like we are doing now, I think everyone else's feedback helped me a lot.")*	FI7 - Alexis
	Increased academic interaction with colleagues and support received. *("It was fun going to Alexis after a lesson and ask her how it went and things like that.")*	FI7 - Lily
General support	General support *("They were definitely there to support me (laughing) through this whole process.")*	FI7 - David
	Support via different platforms: At school, on smartphones, and during the focus-group interviews *("I remember one time. I was going up and he was going down (or the other way around) and we just chatted for like 10 minutes about a lesson, sharing ideas, and questioning each other, and helping each other out." (Alexis - FI7)*	FI7 – David and Alexis
Enjoyment	Pure enjoyment	FI7 – David and Lily
	Fulfilling a stressful duty. *("It was more stressful than enjoyable.")*	FI7 - Roy

4.12 Conclusion

Chapter 4 provided a wide variety of summaries of results and findings related to the study's research questions and the conceptual framework. This included an exploration of the participant teachers' challenges while teaching with tablets and how these challenges were addressed through the development of their *Digital Learning Competencies*. The two lessons planned, presented, observed, and reflected on were included. This included discussions of *DDD* elements, constructive alignment, surface and deep learning, and technology integration levels. Comparisons were made among participants' individual designs for the two lessons as well among different participants' designs. Participants' experiences of the *DDD* observation sheet, the study as TPD opportunity and their experiences as CoP members were also explored.

CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of the study's findings as expressed in the addressing of the primary and secondary research questions. Based on these findings and the study's design in general, the study's limitations are indicated and recommendations for future research are provided.

5.2 Conclusions

The primary research question encompassed the secondary research questions as illustrated in Figure 5-1.

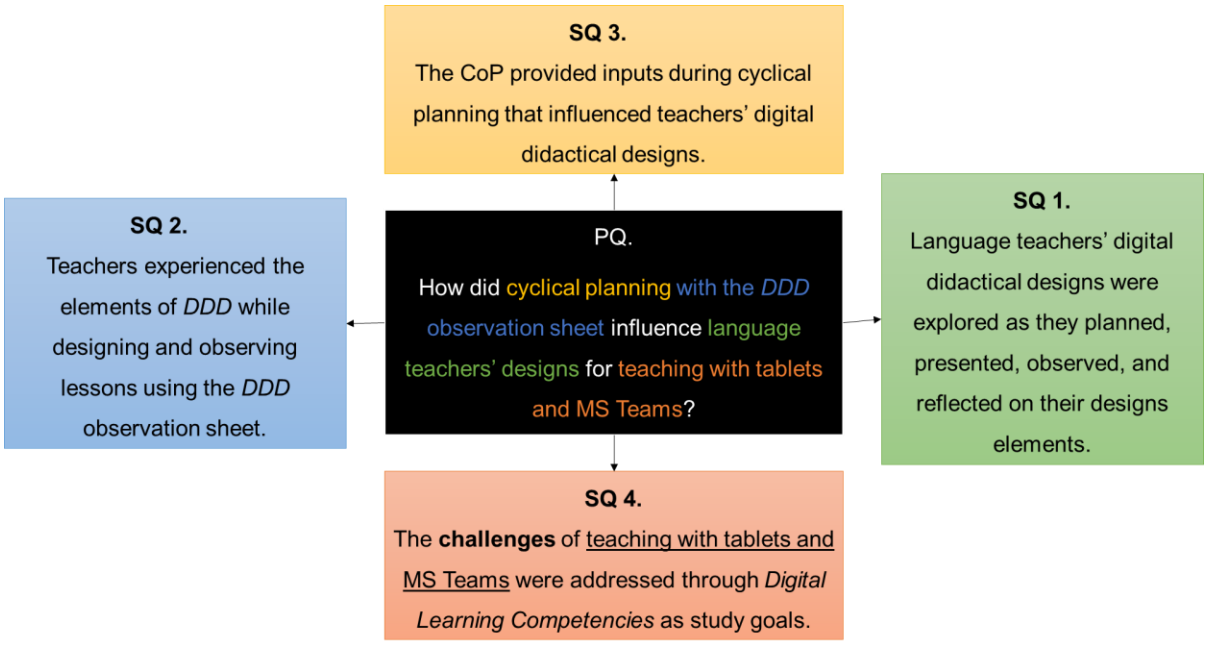


Figure 5-1. The secondary research questions addressed the primary research question

The study's conceptual framework was also addressed through the main and secondary research questions as illustrated in Table 5-1.

Table 5-1. The links between the conceptual framework and the research questions

Element of the conceptual framework	Research question
***DDD* framework**	PQ and SQ1
***SAMR* levels**	SQ1
Levels of technology integration	SQ1
Surface and deep learning	SQ1
Context	• PQ and SQ2: Cyclical planning with the *DDD* observation sheet • SQ3: CoP • SQ4: *Digital Learning Competencies*

5.2.1 Primary research question

PQ. How did cyclical planning with the *DDD* observation sheet influence language teachers' designs for teaching with tablets and MS Teams?

The study's TPD opportunity provided participants with a continuous programme that improved participants' knowledge, attitudes, and skills as illustrated by Steyn and Van Niekerk (2002). On a knowledge level, participants easily amalgamated their normal teaching practices with the *DDD* requirement to incorporate digital tools. Participants included more variety in their lessons by using a variety of apps and digital tools. This positively influenced the future pedagogies of David, Lily, and Alexis, which shows agreement with the conviction of Steyn and Van Niekerk (2002).

In terms of skills, most participants' personal technical skills improved, while Roy's learners' skills improved. Participants' attitudes toward the value of digital tools, also for future use, improved as they implemented these. The implemented changes in lessons also positively influenced learners' attitudes and learning experiences.

As suggested by Bernadine (2019) and Dlamini and Mbatha (2018), the study's TPD opportunity addressed the need for TPD programmes to stimulate the local integration of digital tools. Further suggestions of Dlamini and Mbatha (2018) were incorporated as the TPD programme was designed with the participants' context in mind, while also engaging language teachers in prolonged involvement in the TPD. The TPD and CoP also managed to combine the expertise of the more and less experienced digital tool users, as suggested by MacDonald (2009). David provided frequent technical support to the CoP members throughout the study. Within the CoP, members demonstrated and stimulated the use of new tools, as described by Ertmer et al. (2012) and Tondeur et al. (2016). Albion et al. (2015) and Tondeur et al. (2016) also indicate that CoPs provide an excellent platform for participants to collaborate where ideas can be shared, and practices can be demonstrated. This was relevant to this study as well.

The five principles of effective technology integration in Figure 2-9 (Department of Education, 2004) were integrated in the study. A variety of *learner-centred approaches* were included as learners became designers who could educate themselves. The learning was authentic and personal. In lesson 2, high levels of *collaboration* (specifically for peer-assessment) were visible. Participants managed to restructure

their lessons towards *deep learning* as suggested by Jahnke et al. (2017), especially during their second lesson presentations. All participants' second lessons represented collaborative, deep learning. In general, the use of tools developed learners' *technical skills and cognitive abilities*. Creativity featured in learners' designs, while communication occurred as teacher-learner and learner-learner interactions. While some learners and classes exhibited critical thinking abilities, this skill still needs further development, especially in how the internet is used. Learners engaged with *new learning environments* by consulting the internet for information, and by presenting their work to their peers as their audience.

The Department of Basic Education (2017) recommends eight characteristics of TPD programmes, presented in Table 2-7. This study was aimed at addressing participants' *contextualised challenges*. Participants had the opportunity to *learn* about *DDD* and then applied the elements to their lesson designs. The *collaborative sharing* among CoP members was valuable to increase the quality of teachers' designs, while also providing motivation. *Reflection* was done regularly, and this proved to be an insightful experience for participants. The *lasting impact* of the study was questioned by Roy, although the other participants' future pedagogies were influenced. *DDD*'s elements were found to be more relevant for well-resourced schools and for languages, but not all school subjects.

5.2.2 Secondary research question 1: Language teachers' digital didactical designs

SQ1. What are the design elements of teachers' digital didactical designs?

The participants managed to maintain a balance between tablets and other teaching and learning materials, as seen in the work of Jahnke et al. (2014b), as well as other teaching methods. During all lessons, except Roy's first lesson where digital tools were excluded (although online teaching occurred), the participants presented true digital didactical designs. Participants portrayed the characteristics of "innovative teachers" as they changed their roles and didactics, as described by Montrieux et al. (2015, p. 7). Learner creativity, independent app discovery by learners, changed teacher roles, and heightened learner engagement were seen (compare ChanLin (2017); Jahnke et al. (2014b); Montrieux et al. (2015); Rikala et al. (2013)).

Learners were equipped to become knowledge creators who accessed the internet for information, while teachers acted as learning facilitators (Kopciewicz & Bougsiaa,

2018). Formative, continuous feedback was one of the less prominent elements in participants' lessons. Based on this, the true quality of participants' digital didactical designs were influenced, as described by Jahnke and Kumar (2014).

In terms of clusters of digital didactical designs, all participants presented cluster A lessons (Jahnke et al., 2017) during their second lessons. Roy and Alexis' first lessons developed from clusters C and B accordingly based on the CoP's inputs as well as improved conceptualisation of the *DDD* elements. In general, participants found literature lessons (i.e. poetry, prose, and film study) more suitable for *DDD* than language lessons. Language lessons typically required more teacher-led explanations as identified by the study's participants and Raney (2018). Alexis, however, successfully presented a language lesson, and had her learners do prepared orals using digital tools. Roy, on the other hand, did not truly incorporate digital tools in his language lesson. Online assessment (both teacher and peer assessment) was dealt with in various degrees of success by all participants, mostly during their second lessons. This addressed a need identified by the study of Mthelebofu (2018) where tablets need to be utilised for assessment in South African language classrooms. For their second lessons, all participants presented prose and poetry lessons and successfully integrated digital tools, based on their *DDD* clusters.

Participants' levels of technology integration, including their *SAMR* levels as presented by Puentedura (2006) were improved. All second digital didactical lesson designs were either at the *modification* or *redefinition* levels, where digital tools played a significant role in the success and type of lesson execution.

5.2.3 Secondary research question 2: Teachers' experiences of the *DDD* observation sheet

SQ 2. What were teachers' experiences of using the *DDD* observation sheet to design and observe lessons for tablet teaching with MS Teams?

As participants used the *DDD* observation sheet to observe and score their own and their peers' lessons, they interpreted the criteria differently. This affected their scores. The varied interpretations were negotiated during the reflection sessions to reach a unified understanding of the elements of *DDD*.

The participants found that the observation sheet was highly detailed and required too much time to complete, therefore they often worked too quickly. The sheet was also often too prescriptive and even unrealistic, according to Roy. The participants found peer-assessment to be the most difficult element to assess.

The researcher assumed that participants would use the observation sheet for lesson design/planning as well as for observational purposes, but only Lily referred to the sheet while planning. The others enhanced their normal teaching practices by incorporating digital tools, and this enabled sufficient digital didactical designs. Participants gained deeper insight into the elements of *DDD* through the reflections on lesson 1. This enabled them to design even stronger digital didactical designs for their second lessons.

Participants made valuable contributions to how the observation sheet could be improved from lesson 1 to lesson 2. Some of these contributions were practical to include and an updated observation sheet, more contextualised for the study, was used during the observation of participants' second lessons.

In the end, participants felt that the observation sheet contained difficult language, while an MS Excel sheet was not user-friendly enough. Instead, participants indicated that a discussion on presented lessons, rather than participants completing the observation sheet on their own, would be more natural.

5.2.4 Secondary research question 3: The influence of the CoP on teachers' digital didactical designs

SQ 3. How did the Community of Practice influence teachers' digital didactical designs for tablet teaching with MS Teams?

The CoP was highly beneficial in its technical support as this enabled more successful lessons driven by digital tools. As the members interacted with one another, they often shared ideas, felt inspired, and assisted each other to understand the elements of *DDD*. In general, the CoP ensured that members felt supported while engaging in the study's TPD opportunity, which led to higher levels of enjoyment. The benefits that participants reaped from the study's CoP were well-aligned to the definitions and benefits in the literature (Albion et al., 2015; ChanLin, 2017; MacDonald, 2009; Serrat, 2010). The results of participants' supportive sharing opportunities were innovative

solutions, higher levels of technology integration, inspiration, and ultimately changed practices (compare ChanLin (2017); Geldenhuys and Oosthuizen (2015); Serrat (2010); Tondeur et al. (2016)).

5.2.5 Secondary research question 4: Teachers' challenges addressed through *Digital Learning Competencies*

SQ 4. To what extent did the study's goal to develop teachers' *Digital Learning Competencies* assist to address their challenges of teaching with tablets and MS Teams?

The participants experienced many of the same challenges (cf. Heading 4.3.1) as found in the literature, but managed to overcome these due to their personal dedication, motivation, and support received from the CoP during the TPD opportunity. Their personal goals, based on the *Digital Learning Competencies* (Department of Basic Education, 2017) as well as the study's aims, enabled them to overcome more than half of their identified challenges. Evidently, the study succeeded to address the participants' needs, both personal and professional as suggested by Kalogiannakis (2010).

5.3 Limitations of the study

Any study has limitations. This study's qualitative methodological stance with its action research design, sampling strategy, and data analysis procedures had unique limitations that the researcher addressed throughout. The sample for this study was biased to the extent that all participants wanted to partake in the study's TPD opportunity to improve their skills of teaching with digital tools. The study's reach would have been more significant if other teachers, who incorporated digital tools less or who were less willing to participate, were also included in the study.

The other, more specific limitations experienced during this study were threefold. Firstly, the many academic concepts associated with *DDD* (i.e. surface and deep learning and constructive alignment) were not well grasped by the participants due to too little time spent on the deep exploration of these concepts. In future, participants should not have to reflect on or observe these concepts. Alternatively, more time needs to be spent on understanding these concepts. Another recommendation could

be to simplify the observation sheet to be more user-friendly, especially by containing fewer academic concepts.

Secondly, while most of the participants indicated that the gains of this study would also influence their future pedagogies, this was not the opinion of all.

Thirdly, the use of only online lesson observations limited the observers' ability to observe the entire and authentic classroom interactions. This could not have been prevented under the Covid-19 circumstances, but in-class observations are preferable.

5.4 Recommendations

Future research could explore how computers are used as mind tools or cognitive tools when using *DDD*, as the practice of *learning with computers* was underlying in the study, but not fully explored.

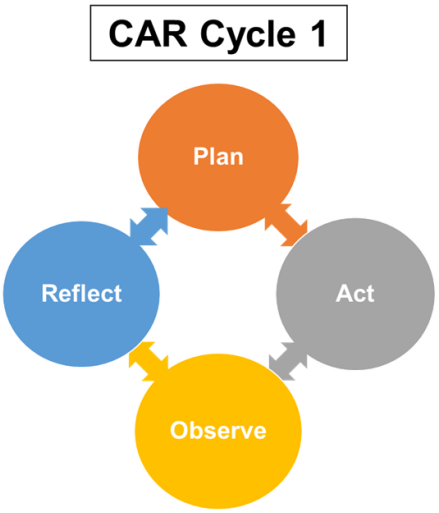
The long-term impact of a study as TPD opportunity could be investigated through a longitudinal study in future. Alternatively, the *Diagnostic Self-assessment Tool for Teachers* as provided in the *Professional Development Framework for Digital Learning* (Department of Basic Education, 2017) could be used at the start and at the end of the study. This instrument will provide a diagnostic and summative assessment opportunity to determine participants' levels of digital competencies and how these developed over the course of the study's TPD opportunity.

In future, a deeper exploration of every participant's didactics (e.g. how the different elements interacted with one another) could also be undertaken.

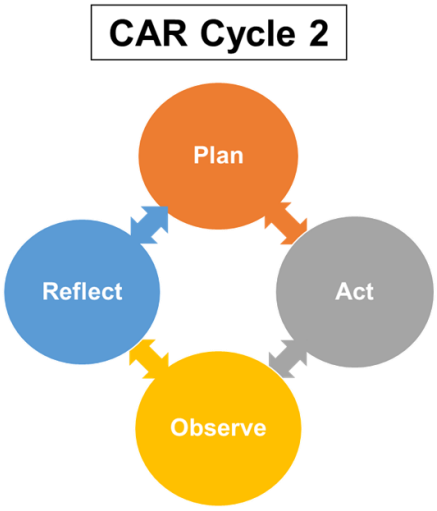
Based on the experiences and findings of this study, the researcher suggests that a TPD opportunity aimed at *DDD* integration should be managed within a CAR structure. Therefore, the cycles for such a TPD opportunity are recommended in Figure 5-2.

Since the use of participant lesson observations was too much of an academic exercise, the researcher recommends a second update to the *DDD* observation sheet in Figure 5-3. This updated version is a Google Form in checklist format. The checklist is only used during the lesson planning (design) phase, and not for observational purposes. The criteria have also been simplified to decrease the level of difficulty of descriptors used on the original *DDD* observation sheet. These changes address participants' suggestions from FI3 as well as their experiences of using the *DDD*

observation sheet in general. For lesson scoring and reflections, oral discussions rather than the individual completion of the observation sheet's criteria, is suggested.



	1. Plan
1.1	Introduce the project (overview).
1.2	Explore participants' challenges, visions, and lesson design elements.
1.3	Introduce the elements of *DDD*; discuss the *DDD* observation sheet presented as a checklist.
	2. Act
2.1	Participants share their planned lesson designs; feedback/inputs from CoP; check lesson designs against the *DDD* checklist.
	3. Observe
3.1	The researcher and participants observe peer lessons and make general notes.
	4. Reflect
4.1	The researcher uses the updated *DDD* observation sheet to guide oral participant reflections; determine a single score per *DDD* element based on CoP consensus.



	1. Plan
1.1	Incorporate changes suggested in CAR 1.
	2. Act
2.1	Participants share their planned lesson designs; feedback/inputs from CoP; check lesson designs against the *DDD* checklist.
	3. Observe
3.1	The researcher and participants observe peer lessons and make general notes.
	4. Reflect
4.1	The researcher uses the updated *DDD* observation sheet to guide oral participant reflections; determine a single score per *DDD* element based on CoP consensus.
4.2	Reflect on the TPD opportunity as a whole.

Figure 5-2. Suggested use of CAR cycles for a *DDD* TPD opportunity

Lesson design: Checklist for Digital Didactical Design

This checklist can be used to check whether true Digital Didactical Design lessons have been designed.

Teaching goals / intended lesson outcomes

- [ ] Goals are explained to learners orally and displayed digitally as well.
- [ ] Goals develop learners' subject knowledge and skillsets.
- [ ] Goals are available online (e.g. on MS Teams).
- [ ] Learners design lesson goals as well.
- [ ] Goals and criteria are communicated at the beginning of the lesson.

Learning activities

- [ ] Learners actively participate in class.
- [ ] Learners collaborate with their peers.
- [ ] Learners work toward their goals.
- [ ] Learners think about (reflect on) what they are doing.
- [ ] Learners make/produce/design something.
- [ ] Learners are engaged and not bored/distracted.
- [ ] The activity is relevant to learners' own worlds/experiences.
- [ ] Learners present their work to a real audience (e.g. peers / parents / another class).
- [ ] Learners can organise parts into a new whole.
- [ ] Learners use the internet and other sources (not only in the classroom) to obtain information.

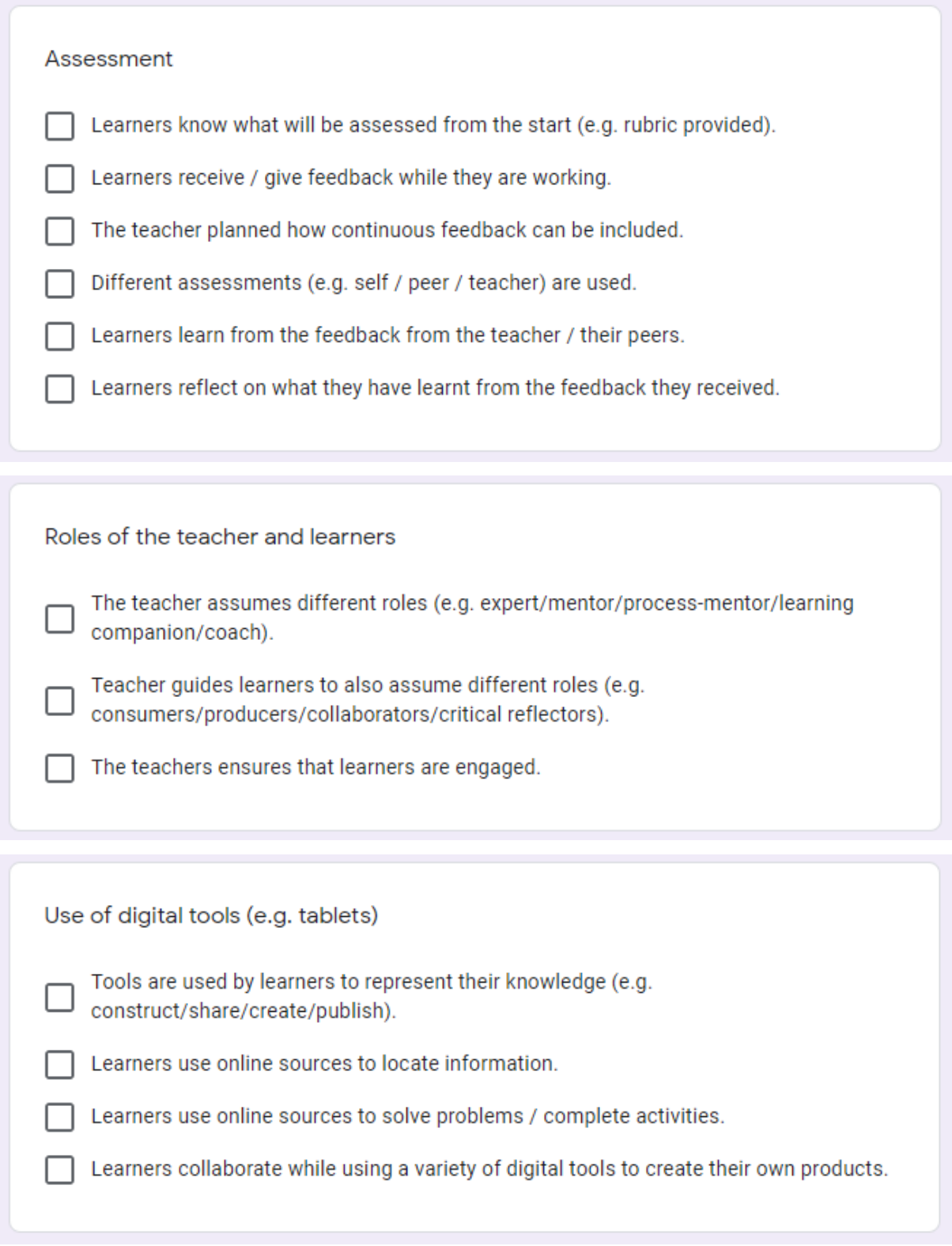


Figure 5-3. Final update to the *DDD* observation sheet

5.5 Conclusion

DDD was intended for a teacher-led curriculum which made it less relevant to the South African teaching context. Yet, by interacting with the elements of *DDD* and its observation sheet, this study's participants gained an appreciation for lessons that successfully integrate digital tools. Through cyclical planning and inputs from the CoP, the participants managed to design true digital didactical designs for their language classrooms. The cyclical planning (i.e. two CAR cycles) provided participants the opportunity to improve on their designs as they understood the elements of *DDD* better. Were it not for the cyclical planning, all participants' designs would not have been designs that enabled collaborative, deep learning while implementing technology at *modificatio*n and *redefinition* levels of the *SAMR* model. The context of a study as TPD opportunity over the course of six months and the establishment of a CoP enabled a more lasting impact of the study on participants' pedagogies (or didactics). In general, the findings of the study correlated well with the existing literature on the topic of didactics, professional development, and communities of practice.

This study managed to contribute a CAR model for TPD using *DDD*. While most of the model's elements were already implemented during this study's TPD, some of the elements would need further practical application before this model could be accepted for wider practical use. The suggested elements that were not applied in this study include the application of an introductory discussion of the *DDD* checklist and the checking of participants' proposed lesson plans against the *DDD* checklist upon lesson design finalisation. Lastly, it is suggested that participants only do general lesson observations after which they participate in a joined, oral reflection and scoring of the lessons.

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APPENDICES

Appendix A: Data gathering instruments

A1. Focus-group interview 1 (FI1): Designing participant profiles

1.	**Teaching with tablets and MS Teams**
1.1	Explain for what purposes and how you are using tablets and MS Teams in your teaching (i.e. normal practice and during Covid-19).
1.2	What challenges (technical/ own skills) do you encounter while teaching with tablets using MS Teams?
1.3	What are your visions of teaching with tablets and MS Teams in your classroom?
2.	**Elements of good lesson design**
2.1	What do you regard as elements of good lesson design?
2.2	Why are these elements important to include?
3.	***Digital Learning Competencies***
3.1	Identify the *Digital Learning Competency(ies)* that you would like to address in your own practice for the duration of the study.
3.2	Why are these competencies important for you to develop?

A2. Focus-group interview 2 (FI2): Elements of *DDD*

1.	**Planning for the study**
1.1	What strengths do we possess in the CoP? What can we learn from each other?
1.2	What are your goals for this study?
1.3	What apps can you use in MS Teams?
2.	**Elements of *DDD***
2.1	To what extent is every element of *DDD* relevant to your current practice? Explain.

A3. Focus-group interview 3 (FI3) / observation: Planning for lesson 1

1.	**Participants' *SAMR* levels (5th *DDD* element from FI2)**
1.1	After watching the *SAMR* video, on which level is your normal practice: The S, A, M, or the R? Explain.
2.	**Feedback on the designed lesson**
2.1	Share your planned lesson design with the community members. Provide feedback and inputs on one another's designs, considering practical implications as well as the integration of the elements of *DDD.*

A3.1 Semi-structured *DDD* observation sheet

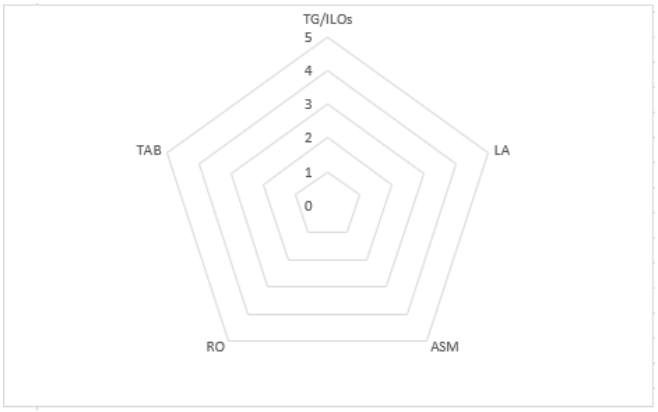
This observation sheet (coding scheme) as published by Jahnke et al. (2017) was used with written permission from the author.

***Digital Didactical Design* elements**	**Level descriptors**
Teaching Goals / Intended Learning Outcomes Clear and visible to students	1: Not clear / visible; no communication; focus on content.
	2: Shows indicators of 3 and 1, but not fully 3 or 1.
	3: Oral communication.
	4: Shows indicators of 5 and 3, but not fully 5 or 3.
	5: Clear and visible to students; indicates criteria for learning progress from the start; provided on a source; focused on skills development; co-aims of students are included.
Learning Activities Toward deep learning by producing in engaged, authentic, open settings	1: Textbook teaching (surface learning e.g. memorising, remembering, repetition of facts); theoretical, not practical problems
	2: Shows indicators of 3 and 1, but not fully 3 or 1.
	3: Surface learning and first signs of deep learning (i.e. active, collaborative, authentic, goal-directed, and reflective); Students are not as engaged as in 5: Bored / Too many other distractors.
	4: Shows indicators of 5 and 3, but not fully 5 or 3.
	5: LAs have a range from surface but a focus on deep, meaningful learning with indicators such as active, collaborative, authentic, goal-directed, and reflective; students produce something, engaged classrooms, collaboration with peers; activities are connected to the students' world and include a real-world problem, a real audience; students critically reflect on existing content, relate knowledge to new knowledge; students produce with internet assistance and other resources from outside the school.
Assessment Process-based	1: Summative feedback at the end (more summative than formative)
	2: Shows indicators of 3 and 1, but not fully 3 or 1.
	3: Coincidental feedback (not only technical assistance); teacher-feedback only when asked; passive support
	4: Shows indicators of 5 and 3, but not fully 5 or 3.
	5: Criteria for learning progress is visible to students from the start; feedback/feed-forward only at the end, but mainly process-based assessment for learners' development; teacher plans and creates pro-assessment (i.e. formative evaluation); a range of self-assessment, peer-reflective learning, and teacher feedback (e.g. students document learning electronically and teacher then requires learner reflection).
Social relations Multiple roles (not only consumers)	1: Teacher as the expert only; students are consumers (i.e. solve closed questions; tasks with one correct answer).
	2: Shows indicators of 3 and 1, but not fully 3 or 1.
	3: Teacher fulfils one or two roles, but mostly expert role; teacher does not support active student engagement.
	4: Shows indicators of 5 and 3, but not fully 5 or 3.
	5: Teacher adopts different roles (i.e. expert, process mentor, learning companion, coach); fosters students to adopt different roles (consumers, producers, collaborators, critical reflectors); teacher engages students, activates students to change roles; students are in several roles (peer-teachers; construct own learning aims; create own learning tasks); teacher support for student reflection on roles and development of new roles
Web-enabled technologies Used for cross-actions	1: SUBSTITUTION (Technology replaces pen and paper): Low extent: Drill and practice; Students primarily work on their own with technology; unrelated to real-world
	2: Shows indicators of 3 and 1, but not fully 3 or 1.
	3: Between AUGMENTATION and MODIFICATION (Technology substitutes existing media): Medium extent
	4: Shows indicators of 5 and 3, but not fully 5 or 3.
	5: REDEFINITION (Technology is used in a whole new way). High extent: Multimodal (e.g. writing texts, camera app, digital paintings, using apps for collaborative creation); students construct, share, create, and publish their knowledge to a real audience; students use online resources (actively select resources beyond the best school library); signs of cross-action (use online-world to solve a learning activity)

For the actual use of the observation sheet, the researcher provided the participants with the detailed level descriptors in A3.1, but designed an MS Excel spreadsheet for participants to complete during the observation. The MS Excel sheet is provided in A3.2.

A3.2 *DDD* observations sheet for lesson 1

Fill-in semi-structured observation sheet for *Digital Didactical Design*		
Date of observation		
Subject and grade of lesson		
Topic of lesson		
Observer		
DDD elements	**Score (1 - 5)**	**Comments / Descriptions**
TG/ILOs		
LA		
ASM		
RO		
TAB		



	Comments / Descriptions
Comment on the constructive alignment between the elements	
Report on observed problems	
Describe any creative elements	
Other interesting / unexpected things that you have noticed	

A4. Focus-group interview 4 (FI4A and FI4E): Reflection on lesson 1 and digital didactical designs

1.	**Lesson presentation and participants' digital didactical designs**
1.1	What went well and why?
1.2.1	What can be done better?
1.2.2	Why can this be done better?
1.2.3	How can this be done better?

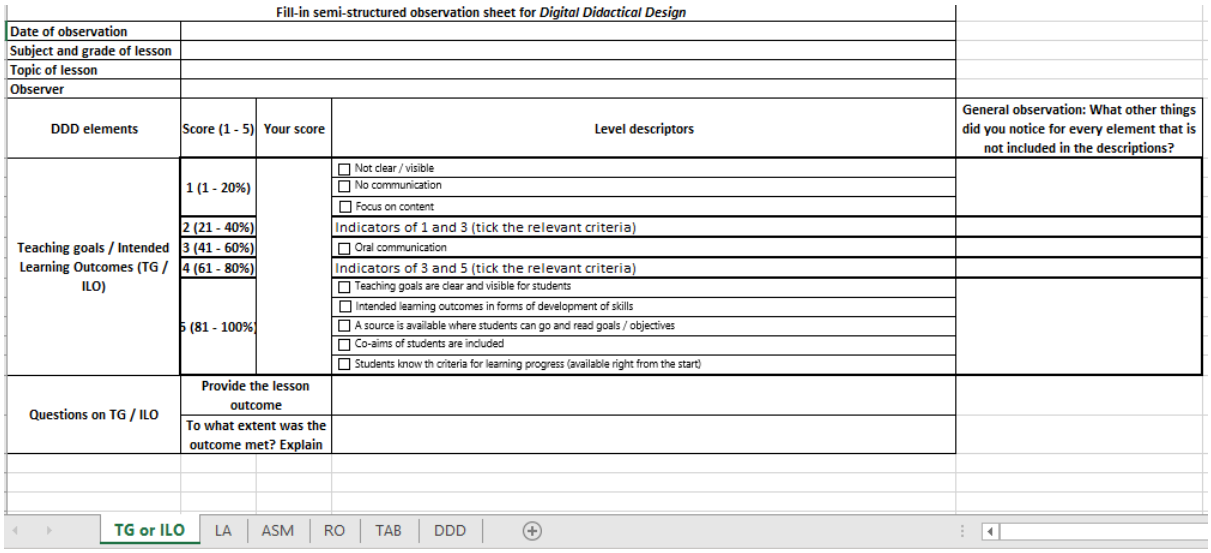
2.	**Discussion of differences in scores among the observations of the three observers**
2.1	Why do we as observers differ in opinion when scoring some or all of the *Digital Didactical Design* elements?
3.	**Elements of *DDD* and the observation sheet**
3.1	How user-friendly is the MS Excel spreadsheet and its criteria?
3.2	What other lesson design elements would you also include that are not included in *DDD?*
3.3	Are there other elements lacking in *DDD* and its observation sheet? Discuss these.

A5. Focus-group interview 5 (FI5) / observation: Planning for lesson 2

1.	**Feedback on the designed lesson**
2.1	Share your planned lesson design with the community members. Provide feedback and inputs on one another's designs, considering practical implications as well as the integration of the elements of *DDD.*

A6. Updated *DDD* observation sheet

A6.1 TG/ILO with tabs visible



Fill-in semi-structured observation sheet for *Digital Didactical Design*				
Date of observation				
Subject and grade of lesson				
Topic of lesson				
Observer				
DDD elements	Score (1 - 5)	Your score	Level descriptors	General observation: What other things did you notice for every element that is not included in the descriptions?
Teaching goals / Intended Learning Outcomes (TG / ILO)	1 (1 - 20%)		☐ Not clear / visible ☐ No communication ☐ Focus on content	
	2 (21 - 40%)		Indicators of 1 and 3 (tick the relevant criteria)	
	3 (41 - 60%)		☐ Oral communication	
	4 (61 - 80%)		Indicators of 3 and 5 (tick the relevant criteria)	
	5 (81 - 100%)		☐ Teaching goals are clear and visible for students ☐ Intended learning outcomes in forms of development of skills ☐ A source is available where students can go and read goals / objectives ☐ Co-aims of students are included ☐ Students know th criteria for learning progress (available right from the start)	
Questions on TG / ILO	Provide the lesson outcome			
	To what extent was the outcome met? Explain			

TG or ILO | LA | ASM | RO | TAB | DDD

A6.2 LA

DDD elements	Score (1 - 5)	Your score	Level descriptors	General observation: What other things did you notice for every element that is not included in the descriptions?
Learning activities (LA)	1 (1 - 20%)		☐ Students hear what teacher reads from the textbook (surface learning: memorising; remembering / recalling; repetition of facts)	
			☐ Theoretical problems without connecting to a real-world problem	
	2 (21 - 40%)		Indicators of 1 and 3 (tick the relevant criteria)	
	3 (41 - 60%)		☐ Shows signs of shallow learning and first signs of meaningful learning (active, collaborative, authentic, goal-directed and reflective)	
			☐ Students are not as engaged as in 5: They have too much time for doing other things (e.g. playing cards)	
			☐ They are distracted in one way or the other	
	4 (61 - 80%)		Indicators of 3 and 5 (tick the relevant criteria)	
	5 (81 - 100%)		☐ Learning activities have a range from surface but a focus on deep, meaningful learning with indicators such as active, collaborative, authentic, goal-directed, and reflective	
			☐ Students produce something, engaged classrooms, collaboration with peers	
			☐ The activities are connected to the students' world and include a real-world problem (everyday experience)	
			☐ A real audience, students critically reflect on existing content (evaluating / creating / making), relate knowledge to new knowledge	
			☐ Organise / structure content into coherent whole	
			☐ Students are engaged in producing, using the Internet, or other sources beyond the physical school walls (signs of cross-actions like communicating / learning with people who are not in the classroom)	

Questions on LA	Describe the learner activities	
	Describe the teacher activities	
	Name the teaching strategy of the teacher	
	How is LA and TG linked?	
	At what level of Bloom's taxonomy did learners function?	☐ Remember ☐ Understand ☐ Apply ☐ Analyse ☐ Evaluate ☐ Create
	Was this surface or deep learning? Explain.	

A6.3 ASM

DDD elements	Score (1 - 5)	Your score	Level descriptors	General observation: What other things did you notice for every element that is not included in the descriptions?
Assessment: Process-based? (ASM)	1 (1 - 20%)		☐ Feedback only at the end (summative feedback)	
			☐ Character of the feedback is rather summative, not formative	
	2 (21 - 40%)		Indicators of 1 and 3 (tick the relevant criteria)	
	3 (41 - 60%)		☐ Feedback during the class by coincidence but not only technical help	
			☐ Teacher only gives feedback when students ask for support	
			☐ Passive support	
	4 (61 - 80%)		Indicators of 3 and 5 (tick the relevant criteria)	
	5 (81 - 100%)		☐ Criteria for learning progress are visible for students from the beginning of the learning process	
			☐ Feedback/feed-forward at the end but mainly process-based assessment for learners' development	
			☐ A plan exists for how the teacher creates pro-assessment (formative evaluation)	
			☐ A range of forms such as self-assessment	
			☐ Peer-reflective learning and feedback by the teacher (students document learning electronically, with a map, text) and the teacher asks them to go back and reflect	
Question on ASM	Describe the assessment			
	How is ASM and TG linked?			

A6.4 RO

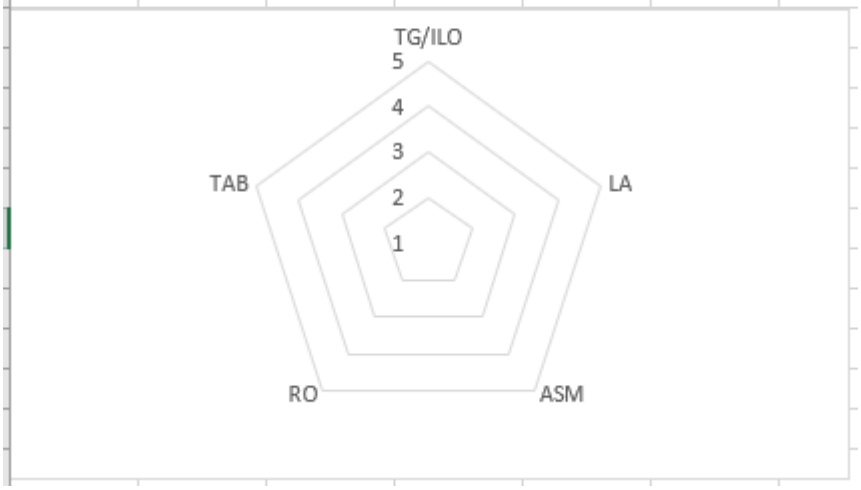
DDD elements	Score (1 - 5)	Your score	Level descriptors	General observation: What other things did you notice for every element that is not included in the descriptions?
Social relations: Multiple roles? (RO)	1 (1 - 20%)		☐ Teacher is in the traditional role of the expert only	
			☐ Students are only seen as consumers (of solving closed questions and tasks in which only one correct andwer is possible)	
	2 (21 - 40%)		Indicators of 1 and 3 (tick the relevant criteria)	
	3 (41 - 60%)		☐ Teacher is in one to two roles but spends majority of time as expert	
			☐ Teacher does not support student engagement to be active	
			☐ Passive support	
	4 (61 - 80%)		Indicators of 3 and 5 (tick the relevant criteria)	
	5 (81 - 100%)		☐ Teacher plays different roles (expert, process-mentor, learning companion, coach)	
			☐ Teacher fosters students to be in different roles (consumers, producers, collaborators, critical reflectors)	
			☐ Teacher engages students	
			☐ Teacher activates the students to change their roles	
			☐ Students are in several roles (teachers for their peers, finding own learning aims, creating own learning tasks)	
			☐ Teacher supports the student reflection of roles and development of new roles	
Question on ASM	List the teacher's roles			
	List the learners' roles			

A6.5 TAB

DDD elements	Score (1 - 5)	Your score	Level descriptors	General observation: What other things did you notice for every element that is not included in the descriptions?
Web-enabled technologies / tablets For cross-actions? (TAB)	1 (1 - 20%)		☐ Low extent, drill and practice ☐ SUBSTITUTION: Students work primarily alone while using technology, not related to the real world (technology substitutes for pen and paper)	
	2 (21 - 40%)		Indicators of 1 and 3 (tick the relevant criteria)	
	3 (41 - 60%)		☐ Medium extent (new technology is substitute for existing media in traditional and some new ways)	
			☐ BETWEEN AUGMENTATION AND MODIFICATION (new technology is substitute for existing media collaboratively)	
	4 (61 - 80%)		Indicators of 3 and 5 (tick the relevant criteria)	
	5 (81 - 100%)		☐ High extent, students construct, share, create and publish their knowledge (to a real audience) ☐ Students use online sources, actively select topics beyond the limitations of even the best school library ☐ Signs of cross-actions (using the online world to solve learning activity) ☐ REDEFINITION: Multimodal such as writing texts, camera app, digital paintings, using apps for collaborative creation	
Question on ASM	Explain how the technology supports the teaching			

A6.6 DDD

TG/ILO	
LA	
ASM	
RO	
TAB	



A7. Focus-group interview 6 (FI6): Reflection on lesson 2 and digital didactical designs

Some general questions were posed to all participants, but specific questions were also asked about every participant's lessons (i.e. indicated as self-reflection or peer-reflection questions).

1.	**General reflection questions on the lessons for all participants (FI6E and FI6A)**
1.1	What went well and why?
1.2.1	What can be done better?
1.2.2	Why can this be done better?
1.2.3	How can this be done better?
1.2	Why did you not tick some of the criteria?

2.	Questions on English lessons (David and Roy) (FI6E)
2.1	**Influence of the CoP**
2.1.1	Did you use the same rubric to assess the MS PowerPoints?
2.1.2	Who first had the idea to use the MS Forms rubric and how did your ideas develop around that?
2.2	**MS PowerPoint as learning tool**
2.2.1	What were the benefits and downfalls of MS PowerPoint as learning tool?
2.2.2	Why were PowerPoint/videos good tools for learners to showcase their understanding or learning?
2.2.3	What is the value of learners as designers (like in your lessons?)

3.	Questions about David's lesson (FI6E)
3.1	**TG/ILOs (Self-reflection)**
3.1.1	Why was the outcome met very well?
3.2	**LA (Self-reflection)**
3.2.1	Did learners use other platforms except for MS PowerPoint?
3.2.2	What was the link in the lesson's LA and TG?
3.3	**ASM (Self-reflection)**
3.3.1	What was the value of peer-assessment?
3.3.2	How did the learners experience this?
3.3.3	What do you understand under the ASM level 5 descriptor that reads: *"A plan exists for how the teacher creates pro-assessment (formative evaluation)"*?
3.4	**RO (Self-reflection)**
3.4.1	How did the learners handle the different roles that they were in (i.e. producers, collaborators, and critical reflectors)?
3.5	**TAB (Self-reflection)**
3.5.1	What made the use of MS PowerPoint on learners' devices difficult?
3.5.3	Are there alternative apps / tools that you could use instead, and will you use these?

4.	Questions about Roy's lesson (FI6E)
4.1	**TG/ILOs**
4.1.1	**Self-reflection:** Do you usually design activity prompts like these? If not, why now?
4.1.2	**Self-reflection:** How, would you say, did these prompts assist learners with the completion of the activities?
4.1.3	**Peer-reflection:** Why was the outcome met very well?
4.2	**LA (Self-reflection)**
4.2.1	How did you come across wheeldecide.com to divide learners into groups?
4.2.2	Why did you decide to include this tool?
4.2.3	Do you think that the screen sharing while discussing the activity prompt benefitted / included learners at home (online) as well? How?
4.3	**ASM (Self-reflection)**
4.3.1	Did you do online marking of learners' work?

4.3.2	What were the benefits of the peer-assessment?
4.4	**RO**
4.4.1	**Self-reflection:** How did you experience your role as facilitator, process mentor, and coach?
4.4.2	**Self-reflection:** How did learners manage as producers, collaborators, and reflectors?
4.4.2	**Peer-reflection:** How did MS Teams support learner collaboration in your lesson?
4.4.3	**Peer-reflection:** How well, do you think, did the teacher (as facilitator, process mentor, and coach) and learners (as producers, collaborators, and reflectors) function in their various roles?
4.4.4	**Peer-reflection:** Comment on how Roy's use of technology for teaching changed from lesson 1 to 2.
4.5	**TAB**
4.5.1	**Self-reflection:** Did learners have meaningful online conversations or in what other ways did they interact?
4.5.2	**Self-reflection:** Which platforms did learners use to make their oral presentation videos?
4.5.3	**Self-reflection:** In the past you indicated that to include all learners and accommodate different learning styles are important to you. Did you manage to do this in this lesson? If yes, how? If not, why not?
4.5.4	**Self-reflection:** Why did such a big change in the use of technology occur from lesson 1 to 2?
4.5.5	**Peer-reflection:** Comment on how Roy's use of technology for teaching changed from lesson 1 to 2.

5.	**Questions on Afrikaans lessons (Lily and Alexis) (FI6A)**
5.1	**Lesson designs: General questions to both participants**
5.1.1	What was the value of peer-assessment in your lessons?
5.1.2	How did learners experience the peer-assessment?
5.1.3	Why were MS PowerPoint videos / *Powtoon* good tools for learners to showcase their understanding / learning? Explain.
5.1.4	What is the value of learners as designers (like in your lessons)?

6.	**Questions about Lily's lesson (FI6A)**
6.1	**TG/ILOs (Self-reflection)**
6.1.1	**Self-reflection:** Tell us about the nicest *Powtoon* that you saw.
6.1.2	**Peer-reflection:** Alexis, in which ways were the learners creative according to you?
6.2	**LA**
6.2.1	**Self-reflection:** What are the advantages of YouTube tutorials?
6.2.2	**Self-reflection:** Did learners' technical skills improve by using *Powtoon*? If yes, how?

6.2.3	**Peer-reflection:** Alexis, why did you feel that learners did not organise their work into a coherent whole?
6.2.4	**To both:** How successful was the use of *Powtoon* in this lesson?
6.3	**ASM**
6.3.1	**To both:** What, according to both of you, does *"a plan for assessment"* look like?

7.	**Questions about Alexis' lesson (FI6A)**
7.1	**TG/ILOs**
7.1.1	**Self-reflection:** Why, according to you, did learners not know the criteria for learning progress right from the start?
7.1.2	**Self-reflection:** Tell us about the nicest video that you saw.
7.2	**LA (Self-reflection)**
7.2.1	Why did you not mark *evaluate* under Bloom's taxonomy? Did learners not evaluate each other's work during the peer assessment?
7.2.2	What do you understand under *surface and deep learning*?
7.3	**ASM (Self-reflection)**
7.3.1	Did learners have plan to time in class? Explain what you did during this time.
7.3.2	How did you decide on a Google Form for the assessment?
7.4	**RO (Self-reflection)**
7.4.1	**Self-reflection:** Learners' roles as reflectors were indicated in the comments. Did you not then support student reflection of roles?
7.5	**TAB (Self-reflection)**
7.5.1	Explain your views on how you used digital tools in the lesson. Why did you only award yourself a 3?
7.5.2	**To both:** How successful was the use of MS PowerPoint in this lesson?

A8. Focus-group interview 7 (FI7): Reflection on the study

1.	***Digital Learning Competencies***
1.1	Which of the *Digital Learning Competency(ies)* that you wanted to address, did you manage to address during this study?
1.2	How, and how well did you address these competencies during the study?
1.3	How did the CoP contribute to the development of your skills?
2.	**The *DDD* observation sheet**
2.1.1	Elaborate on your experiences with the observation sheet in terms of its assistance with lesson design.
2.1.2	Which of these influences will continue to impact on your future teaching practice and lesson design? How?
2.2	Share your experiences of scoring your own and colleagues' lessons using the *DDD* observation sheet.
2.3	Which of the elements did you find difficult to assess and why?
2.4.1	How did you experience the updated observation sheet?
2.4.2	Suggest ways in which the updated observation sheet can be made even more user-friendly for teachers.

2.5	Did working with *DDD* and its observation sheet assist in improving your technical skills? Elaborate on this.
2.6	Did working with *DDD* and its observation sheet improve your pedagogy (i.e. your planning for the tablet classroom using MS Teams?) Elaborate on this.
3.	**Elements of *DDD***
3.1	Which of the *DDD* elements did you find more challenging to include in your designs and why?
3.2	Explain which of the five elements of *DDD* improved the most in your practice in the two lesson design cycles.
3.3.1	What other elements did you include as part of your own digital didactical design?
3.3.2	How and why did you include these elements?
3.4	What was the role, if at all, that learner reflection played in your lesson designs?
3.5	To what extent did you become facilitators, rather than only content deliverers in your lessons?
3.6	At what level of the *SAMR* did your lessons function?
3.7	Is *DDD* relevant to the South African educational context? Why or why not?
4.	**Lesson design**
4.1	How did your lesson design develop learners' ability to - • communicate • collaborate • think critically • be creative?
4.2	Comment on the use of apps during your lessons.
5.	**The CoP**
5.1	How effective was the CoP of this study to improve / assist your practice? Explain.
5.2	Name and describe things that you learnt from the community members.
5.3	Did you only receive feedback and / or input from community members during the organised session? Explain.

Appendix B: Consent letters

B1. Consent letter of the school group's CEO

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Education

Dear Sir/Madam,

INVITATION TO PARTICPATE IN A RESEARCH STUDY:
Collaborative exploration of teachers' digital didactical designs for tablet classrooms.

I am currently enrolled for a Masters' degree at the University of Pretoria. Part of the requirements for the awarding of this degree is the successful completion of a significant research study in the field of education.

The title of my approved research study is**:**
Collaborative exploration of teachers' digital didactical designs for tablet classrooms.
This research study is concerned with teachers' planning and teaching with tablets while incorporating the elements of *Digital Didactical Design* and Microsoft Teams.

I am, therefore, asking your consent to interact with teachers from one of the schools in your group in this research study by means of interviews, classroom observations by the researcher and the teacher-participants as well as group lesson planning sessions. This can include both face to face and online interaction by means of the school's Microsoft Teams platform.

The purpose of this research study is the exploration of the following:

1. The impact of a cyclical Teacher Professional Development opportunity on teachers' designs for tablet classrooms and teachers' digital competencies.
2. The different design elements teachers consider and prioritise during their planning and addressing of subject-specific topics and possible challenges.
3. The value of collaboration within a Community of Practice to assist with the integration of tablets, Microsoft Teams and *Digital Didactical Design*.
4. The influence and usefulness of the elements of *Digital Didactical Design* to inform, even change and improve teachers' designs for the combination of tablet classrooms and Microsoft Teams will be explored.

To gather the required information, I am requesting permission to approach the school's teachers who use tablets and Microsoft Teams in their classrooms. These participants will receive an individual invitation to participate. Teachers will participate in three focus-group interviews (one hour each), two lesson design sessions (two hours each) and two lesson presentations presented by each teacher-participant and observed by the researcher and/or one other participant (two periods per teacher-participant). The times will be negotiated among the researcher and participants and will involve class periods and additional time, possibly after school. I have included all the schedules of interview questions that will be used during the research study.

Please understand that your decision to let the school participate is completely voluntary and that permission for your participation will also be protected by the University of Pretoria. Kindly also note that every individual's participation in the research study will be completely voluntarily and will in no way either advantage or disadvantage them. Each participant will be free, at any stage during the process up to and including the stage at which they authenticate the transcripts of their interviews, to withdraw their consent to participate, in which case their participation will end immediately without any negative consequences. Any and all data collected from them up to that point in the research study will then be destroyed.

All the information obtained during the research study will be treated confidentially. The Department of Education will not have any access to the raw data obtained from the interviews. At no time will either your school or any of the individual participants be

mentioned by name or indeed be allowed to be identified by any means in the research report.

At the end of the research study, you will be provided with a copy of the research report containing both the findings of the research study and recommendations. This research presents a unique opportunity for you and your school to share and compare best practices with the country and the world and further to engage in Teacher Professional Development opportunities aimed at improving teachers' designs, practices and experiences of teaching with tablets in South Africa.

If you decide to allow this school's participation, kindly show this by completing the consent form at the end of this letter.

Thanking you in anticipation.

A van Rooyen
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University of Pretoria
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(076) 201 5584

Dr M Mihai
Supervisor
University of Pretoria
maryke.mihai@up.ac.za
(082) 430 2928

LETTER of CONSENT

SCHOOL AS PARTICIPANT

VOLUNTARY PARTICIPATION IN THE RESEARCH STUDY TITLED:

Collaborative exploration of secondary school language teachers' digital didactical designs for tablet classrooms

I, _____, the CEO of _____(school group) hereby voluntarily and willingly agree to allow one of the schools in the group to participate in the above-mentioned research study introduced and explained to me by Annèl van Rooyen, currently a student enrolled for an MEd degree at the University of Pretoria.

I further declare that I understand, as explained to me by the researcher, the aim, scope, and purpose of collecting information proposed by the researcher, as well as the means by which the researcher will attempt to ensure the confidentiality and integrity of the information she collects.

_____ _____

Full name Signature

_____

Date

B2. Consent letter of the school's principal

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Education

Dear Sir,

INVITATION TO PARTICPATE IN A RESEARCH STUDY:

Collaborative exploration of teachers' digital didactical designs for tablet classrooms.

I am currently enrolled for a Masters' degree at the University of Pretoria. Part of the requirements for the awarding of this degree is the successful completion of a significant research study in the field of education.

The title of my approved research study is**:**

Collaborative exploration of teachers' digital didactical designs for tablet classrooms.

This research study is concerned with teachers' planning and teaching with tablets while incorporating the elements of *Digital Didactical Design* and Microsoft Teams.

I am, therefore, asking your consent to interact with teachers from your school in this research study by means of interviews, classroom and/or online observations by the researcher and the teacher-participants as well as group lesson planning sessions. This can include both face to face and online interaction by means of the school's Microsoft Teams platform.

The purpose of this research study is the exploration of the following:

1. The impact of a cyclical Teacher Professional Development opportunity on teachers' designs for tablet classrooms and teachers' digital competencies.

2. The different design elements teachers consider and prioritise during their planning and addressing of subject-specific topics and possible challenges.
3. The value of collaboration within a Community of Practice to assist with the integration of tablets, Microsoft Teams and *Digital Didactical Design*.
4. The influence and usefulness of the elements of *Digital Didactical Design* to inform, even change and improve teachers' designs for the combination of tablet classrooms and Microsoft Teams will be explored.

To gather the required information, I am requesting permission to approach your teachers who use tablets and Microsoft Teams in their classrooms. These participants will receive an individual invitation to participate. Teachers will participate in three focus-group interviews (one hour each), two lesson design sessions (two hours each) and two lesson presentations presented by each teacher-participant and observed by the researcher and/or one other participant (two periods per teacher-participant). The times will be negotiated among the researcher and participants and will involve class periods and additional time, possibly after school. I have included all the schedules of interview questions that will be used during the research study.

Please understand that the decision for your school to participate is completely voluntary and that permission for your participation will also be protected by the University of Pretoria. Kindly also note that every individual's participation in the research study will be completely voluntarily and will in no way either advantage or disadvantage them. Each participant will be free, at any stage during the process up to and including the stage at which they authenticate the transcripts of their interviews, to withdraw their consent to participate, in which case their participation will end immediately without any negative consequences. Any and all data collected from them up to that point in the research study will then be destroyed.

All the information obtained during the research study will be treated confidentially. The Department of Education will not have any access to the raw data obtained from the interviews. At no time will either your school or any of the individual participants be mentioned by name or indeed be allowed to be identified by any means in the research report.

At the end of the research study, you will be provided with a copy of the research report containing both the findings of the research study and recommendations. This research presents a unique opportunity for you and your school to share and compare best practices with the country and the world and further to engage in Teacher Professional Development opportunities aimed at improving teachers' designs, practices and experiences of teaching with tablets in South Africa.

If you decide to allow your school's participation, kindly show this by completing the consent form at the end of this letter.

Thanking you in anticipation.

A van Rooyen
Student Researcher
University of Pretoria
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(076) 201 5584

Dr M Mihai
Supervisor
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maryke.mihai@up.ac.za
(082) 430 2928

LETTER of CONSENT

SCHOOL AS PARTICIPANT

VOLUNTARY PARTICIPATION IN THE RESEARCH STUDY TITLED:

Collaborative exploration of secondary school language teachers' digital didactical designs for tablet classrooms.

I, _____, the principal of

_____hereby voluntarily and willingly agree to allow my school to participate in the above-mentioned research study introduced and explained to me by Annèl van Rooyen, currently a student enrolled for an MEd degree at the University of Pretoria.

I further declare that I understand, as explained to me by the researcher, the aim, scope, and purpose of collecting information proposed by the researcher, as well as the means by which the researcher will attempt to ensure the confidentiality and integrity of the information she collects.

_____ _____

Full name Signature

_____

Date

School stamp

B3. Consent letter of the participants

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Education

Dear Sir / Madam

INVITATION TO PARTICPATE IN A RESEARCH STUDY:

Collaborative exploration of teachers' digital didactical designs for tablet classrooms.

I am currently enrolled for a Masters' degree at the University of Pretoria. Part of the requirements for the awarding of this degree is the successful completion of a significant research study in the field of education.

The title of my approved research study is:

Collaborative exploration of teachers' digital didactical designs for tablet classrooms.

This research study is concerned with teachers' planning and teaching with tablets while incorporating the elements of Digital Didactical Design and Microsoft Teams.

You are hereby invited to participate in this research study, which aims to explore the following:

1. The impact of a cyclical Teacher Professional Development opportunity on teachers' designs for tablet classrooms and teachers' digital competencies.
2. The different design elements teachers consider and prioritise during their planning and addressing of subject-specific topics and possible challenges.
3. The value of collaboration within a Community of Practice to assist with the integration of tablets, Microsoft Teams and *Digital Didactical Design*.
4. The influence and usefulness of the elements of *Digital Didactical Design* to

inform, even change and improve teachers' designs for the combination of tablet classrooms and Microsoft Teams will be explored.

The scope and responsibility of your participation includes the following sequence of events:

1. Participate in a focus-group interview with the researcher and the other participants on the use of tablets and Microsoft Teams in your classroom (one hour after school or a convenient time for all participants).
2. Receive some basic background information and then plan a lesson for your tablet classroom using guidelines from *Digital Didactical Design* as well as guidance from the other participants and the researcher (two hours after school or a convenient time for all participants).
3. Present your planned lesson to one class while the researcher and one participant observe, score and comment on your lesson using a set observation sheet. You will also score and comment on your own lesson afterwards (two class periods).
4. Engage in a reflection session on the lesson that you and the other participants planned and presented (one hour after school or a convenient time for all participants).
5. Plan a second lesson with the help of *Digital Didactical Design,* the other participants and the researcher (two hours after school or a convenient time for all participants).
6. Present your second lesson to the same class as the previous time, while only the researcher observes, scores and comments on your lesson. You will also score your lesson again afterwards (one class period).
7. Participate in a focus-group interview after the second lesson was presented to a class. (one hour after school or a convenient time for all participants).

To gather the information I require for this research, I hereby request permission to engage you in three focus-group interviews, two lesson design sessions and two lesson presentations presented by you and observed by the researcher and/or one other participant. These activities will be completed from June – September 2020 and the activities will be based on your experiences of lesson design for teaching and learning with tablets while incorporating Microsoft Teams and *Digital Didactical*

Design. I have included the schedules of interview questions that will be used during the research study.

Kindly note that this is a voluntary participation research study and that permission to participate is further protected by the University of Pretoria. Your participation in this research study will in no way either advantage or disadvantage you or any other participant.

Each participant will be free, at any stage during the process and including the stage at which they authenticate the transcripts of their interviews, to withdraw their consent to participate, in which case their participation will end immediately without any negative consequences. Any and all data collected from them up to that point in the research study will then be destroyed.

All the information obtained during the research study will be treated confidentially. No person will have access to the raw data, including the Department of Education. Both the interviewee name and the name of the institution in which he or she works will not be revealed in this report.

The findings and the recommendations of this research study will be shared with you. This research presents a unique opportunity for you and your school to share and compare best practices with the country and the world and further to engage in Teacher Professional Development opportunities aimed at improving teachers' designs, practices and experiences of teaching with tablets South Africa.

If you decide to participate in this research study, kindly indicate this by completing the consent form at the end of this letter.

Thanking you in anticipation.

Yours in service of education,

A van Rooyen
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LETTER of CONSENT

INDIVIDUAL PARTICIPANT

VOLUNTARY PARTICIPATION IN THE RESEARCH STUDY TITLED:

Collaborative exploration of secondary school language teachers' digital didactical designs for tablet classrooms

I, _____, hereby voluntarily and willingly agree to participate as an individual in the above-mentioned research study introduced and explained to me by Annèl van Rooyen, currently a student enrolled for an MEd degree at the University of Pretoria.

The researcher has explained the aim of this research study, its scope and purpose. Data gathering methods proposed by the researcher have been outlined and clearly explained as well as the means in which she will ensure confidentiality and the authenticity and integrity of the information.

_____ _____

Full name Signature

_____

Date

B4. Consent letter of the parents

Faculty of Education

Dear Parent(s)/Guardian(s)

I am currently enrolled for a Masters' degree at the University of Pretoria and will gather some data from your child's classroom for my study titled **Collaborative exploration of teachers' digital didactical designs for tablet classrooms.**

This study is concerned with teachers' planning and teaching with tablets while incorporating the elements of *Digital Didactical Design* and Microsoft Teams.

The purpose of this study is the exploration of the following:

1. The impact of a cyclical Teacher Professional Development opportunity on teachers' designs for tablet classrooms and teachers' digital competencies.
2. The different design elements teachers consider and prioritise during their planning and addressing of subject-specific topics and possible challenges.
3. The value of collaboration within a Community of Practice to assist with the integration of tablets, Microsoft Teams and *Digital Didactical Design*.
4. The influence and usefulness of the elements of *Digital Didactical Design* to inform, even change and improve teachers' designs for the combination of tablet classrooms and Microsoft Teams will be explored.

Your child's teacher is involved in this research study and has given informed consent to participate in this study. The teachers have been involved in interviews and lesson planning related to the study. Another component of the study involves teachers implementing their lesson plans. For this component, I will gather data through classroom observations done during your child's lessons (face to face or online). During these observations, I and other teachers will watch the recorded lessons to observe the classroom practices of your child's teacher. These observations will be

done with observation sheets, video recordings of the teachers and only audio recordings of the class. None of the observers will participate in or influence the learning and teaching activities in the classroom. If it happens that your child's voice is heard on the recording, his / her identity will remain anonymous and confidential, since the study is focused on teachers' practices and not learners' reactions. The lesson recordings and comments made on the observation sheets will be used for research purposes only and remain confidential.

Please understand that the decision for your child to participate is completely voluntary and that permission for his/her participation will also be protected by the University of Pretoria. Kindly also note that every individual's participation in the study will be completely voluntarily and will in no way either advantage or disadvantage them. Each participant will be free, at any stage during the process up to and including the stage where teachers authenticate the transcripts of their interviews, to withdraw their consent to participate, in which case their participation will end immediately without any negative consequences. Any and all data collected from them up to that point in the study will then be destroyed.

All the information obtained during the research study will be treated confidentially. The Department of Education will not have any access to the raw data obtained from the interviews. At no time will either your school, any of the individual participants or learners be mentioned by name or indeed be allowed to be identified by any means in the research report.

If I do not receive a written refusal from you as parent(s)/guardian(s) regarding your child's presence in the language classroom during the observation phase before 07/07/2020, I assume that you agree to the above stated terms.

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