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Teachers' Resistance to taking up a Technological Innovation: A case study

Theunis Christiaan Lötter



A research report submitted to the School of Education, Faculty of Humanities, University of the Witwatersrand in partial fulfilment of the requirements for the degree of Masters of Education

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ABSTRACT

There are clear pressures on educators to innovate through the use of ICTs. iPads and Google Docs are ICT tools that have become preferable in some contexts. This paper investigates the take-up of a technological innovation, using iPads and Google Docs, by three Geography educators. This study reviews the affordances that ICTs make available to educators, as well as the knowledge structure through which educators come to know and use ICTs in order to take advantage of these affordances. An account is given of the pressures to take up and adapt technological innovations by teachers, as well as the success factors already investigated in literature. This investigation seeks to answer the question: do teachers take up the technological innovation and, if so, why? However, review of the adapted documents showed that the educators did not take up the technological innovation completely, specifically with regard to the tool. The HOD and the educators were interviewed with the goal of describing their beliefs and reasoning behind the innovation and its take-up. The case study found that educator knowledge of a tool should allow them to use it in the manner for which it was designed. If a tool is designed for generative use and educator knowledge does not allow them to use the tool in that way, as was the case in this study, use will remain representational or absent.

Keywords: ICTs, teacher resistance, curriculum innovation, affordances, knowledge

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DECLARATION

I declare that this research report is my own, unaided work. It is submitted for the degree of Masters of Education at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination to any other University.

Theunis Christiaan Lötter

August 2019

DEDICATION & ACKNOWLEDGEMENTS

I dedicate this Masters report to my mother Rianda Lötter, my father Louis Lötter, my sister Riandie Marais and my partner Geraldine Rowell. Their continued support and motivation played a critical role in the production of this report. I also thank my supervisor Lynne Slonimsky, who guided and shaped my vision. Finally, and most importantly, I acknowledge God for providing me with the ability and opportunity to travel this journey.

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GLOSSARY

IT Information Technology

ICT Information and Communication Technology

OECD Organisation for Economic Co-operation and Development

HOD Head of Department

UNESCO United Nations Educational, Scientific and Cultural Organization

SAMR Substitution Augmentation Modification Redefinition

RAT Replacement Amplification Transformation

TK Technological Knowledge

PK Pedagogical Knowledge

CK Content Knowledge

TPK Technological Pedagogical Knowledge

TPCK Technological, Pedagogical, and Content Knowledge

CHAPTER 1: INTRODUCTION

This research set out to investigate teachers' resistance to taking-up of a technological innovation introduced in a private school in Johannesburg, South Africa.

Internationally, the word technology has become nearly synonymous with digital technology, information technology (IT), or information and communication technology (ICT). Technology, in a broad sense, has always been used in society and its education, including in South Africa, even with our schools' limited access to it. As recently as 2016, it was reported that only 22.6% of schools in South Africa have access to computers for teaching and learning (Ostrowick, 2016, p. 17). This leaves the country lagging behind other developing nations. Yim et al states, while investigating how Google Docs, an online collaborative word processing tool integrated into a secondary education setting, that the ease of access to computing hardware is a critical success factor for implementing technology in education (2016, p. 4).

In the White Paper on e-Education (Department of Basic Education, 2004, p. 6) the endeavour was that by 2013 "all learners and teachers are ICT capable," and "ICTs are integrated into teaching and learning in all institutions". This is one of the policy documents containing unachieved socio-digital goals, as 66% of schools overall and 15% of high schools have no computer laboratories, and less than 20% of schools have internet connectivity for teaching and learning (National Education Infrastructure Management System, 2018). The South African Minister of Education, Naledi Pandor, expressed her hope that the paper would "ensure optimal availability and use of ICTs in

education" and then lists, categorically, reasons for the introduction and continued development of ICTs in the education system of South Africa as 1. societal and education reasons (overcoming the difficulties of supplying transformative education, the efficacy and reach of "development interventions" and the improved "quality of education and training"), 2. the digital divide in terms of connectivity to the internet, opportunities for local contributions to an international platform and the potential of transferring best practices to the rest of the world, and 3. closing the developmental gap between Africa and the rest of the world through initiatives which "recognise(s) the pivotal role of ICTs … to improve the situation in the health and education sectors". In response to the envisioned solution, by developing ICT-able students and youth (p. 8), the country's Government committed to the use of ICTs in education (2004, p. 13).

The Action Plan for 2019: Towards the Realisation of Schooling 2030 (Department of Basic Education, 2015) expresses this commitment and reasons that "ICTs are becoming so widely used in society that an education without them is rapidly becoming an incomplete education" (p. 17). It is thoroughly acknowledged that digital technology is an integral part of what the country deems to be a valid education. Although previous policy documents have stated ambitious and worthwhile goals in terms of technology integration into education in South Africa, they have not been achieved. The aim is now to accomplish these goals in six years by providing every learner with workbooks and textbooks on a tablet computer (Ramaphosa, 2019), eschewing computer laboratories as a necessary component (NEIMS, 2018). Whether this is an appropriate way to inject technology into education or whether it will even happen remains to be seen, but it does

provide a clear vision of the state's intentions: tablet computers are a significant component in the country's intended educational future.

It is therefore clear that technology, or ICTs, and specifically tablet computers, are a very real part of the future, internationally and in South African education. In support of this idea, a recent systematic review of iPads - a type of tablet computer - which focused on the value that iPads added to pedagogy through their affordances, found that "tablets are largely reported as having a positive impact on student learning" (Major et al, 2017, p. 6) due to their affordances. The study identified the following affordances of tablet computers that do contribute to learning gains (p. 9 - 11): high usability and integration of multiple features within one device, easy customisation and supporting inclusion, touch screens, availability and portability, and the simplicity of applications that are more "intuitive" to use. iPads specifically seem to have penetrated the educational setting like no other innovation before them (Karsenti & Fievez, 2013, p. 5). Much has been said of their potential as learning aids: "…they are ideal tools for sharing content, videos, images, and presentations because they are easy for anyone to use, visually compelling, and highly portable" (Johnson, Adams, & Cummins, 2013, p. 15). In investigating how tablet computers, specifically iPads, affected students' collaboration, "results suggest that fundamental differences exist between iPads and other digital devices that helped these students collaborate, and that when combined with cloud-based apps and services such as Google Docs, extended this collaboration" (Falloon, 2015). This was found to be significant in communication ability when crossing over from formal education to communication outside of education, indicating congruency between society and the tool. Indeed, many potential benefits of iPads in

education have been listed in academia, Karsenti et al stating that "this technological tool has breathtaking cognitive potential after researching its impact on teaching and learning (2013, p.4). After investigating the difference in educational uses between iPads and other tablet devices, Falloon asserts that "results suggest fundamental differences exist between iPads and other digital devices that helped these students collaborate," and that "beyond the hype and rhetoric, exciting potential exists for this tool to support a 'blurring in the line' between learning in formal school and informal environments" (2015, p. 4). These positive perspectives exist alongside those who would state that it is novel (Henderson & Yeow, 2012) and those who espouse that some initial claims about iPads are valid but some must still be justified (Kucirkova, 2014), as well as those who state that it is a valuable tool but must find its place in pedagogy (Nguyen, 2015). Whether empirical studies will concur with the potential findings in the long run remains to be seen, as no school used iPads for teaching and learning before 2011. Perhaps the presence of tablet computers in society and education is pervasive, or perhaps it is merely ubiquitous. However, if the presence of a technological tool in a particular educational institution is a reflection of its presence in the society within which it is based, will the mere proliferation of tablet computers in the South African educational institutions change the way that teachers teach? This is why studies which explore how teachers' take up ICTs into their practices is important.

I the next chapter I review the context of the teachers and the school and especially the introduction of the technological innovation. Culminating in a clear statement of the research question and the aims of the study.

CHAPTER 2: BACKGROUND

Information and Communication Technologies (ICTs) are pervasive in society practically through the communication systems of teachers, knowledge repositories, their environments and students. Despite this, "education systems are, on average, not ready to leverage the potential of technology" (OECD 2015, p. 190) or do not supply the appropriate learning circumstances (OECD, 2013).

Context

In 2015, a private secondary school in the northern suburbs of Johannesburg introduced iPads into their classrooms. For the context of this investigation, their introduction occurred in three stages. The first two stages, the context of the technological innovation itself, will be described first. The third stage, the context of the investigation, will be the main focus of interpretive analysis.

During Stage 1, each learner and educator was equipped with an iPad. Textbooks, and applications for various purposes like word processing, attendance monitoring, email and note-taking, were loaded onto these iPads. However, there was limited pedagogic adoption by educators - instead, they were used for limited administration tasks such as sending and receiving emails, as substitutions for textbooks in teaching and occasionally for word processing in their day-to-day tasks. Although the use of iPads was encouraged in the school through minimal training, by the principal in the staff room, and a select few teachers who were using them before they were introduced, there was not a strong culture of use beyond this. Insofar as a textbook is digitised and loaded onto an iPad,

Hokanson & Hooper would say that the use is simply “representational”. This is the re-representation of information via a different medium, ie. using a tablet to display pictures and text instead of a textbook (2000).

In 2016 during Stage 2, in response to the limited adoption in Stage 1, and accompanied by an ambition of modernising her subject’s teaching strategies and tools to match the contemporary digital era, the subject head (HOD) of Geography challenged the teachers in her department. She challenged them to use iPads independently and to leverage their potential beyond the substitution of textbooks and the occasional typing task. At the end of the year, the HOD was still unsatisfied with the progress of adoption by the educators in her department.

In 2017, the HOD took it upon herself to design a scaffold for the implementation of a technological innovation in her department. Throughout the year, she created a semi-structured base framework to advance the teaching and learning of the subject Geography through the use of ICTs. This scaffold consisted of content, a set of selected digital tools and a method, for teachers to adapt and use. At this point I became interested in researcher the teachers’ adoption of the technolgical innovation and I begain my investigation of the technological innovation.

The content was modelled on the government-designated curriculum, grouped and sequenced by the Geography department collectively during subject meetings. She collated and included content, activities and media resources previously used independently by the educators. She constructed this within an online collaborative word processing document, a Google document. Within this Google document, the

HOD compiled the collated content and suggested activities. One such base Google document was created per topic within the subject.

In 2018, Stage 3, each teacher was provided access to their own individual copy of this base framework. They were instructed to change this base document on their iPads or school computers as they saw necessary or preferable, in terms of their pedagogical reasoning and beliefs. The HOD would ideally have liked major changes, as she stated that her base framework "was the sort of starting point but it wasn't meant to be there at the end. In fact if I looked back a year later in December, I didn't want to see my project; I wanted to see something that was changed, manipulated". She strongly encouraged her teachers to adapt the framework to suit their approaches to teaching. Once a teacher then deemed it to be adapted to the way they wanted to use it, each learner would receive a copy of their teacher's adjusted version of the base document. On their iPads, within this digital hybrid work- and textbook, the learners would complete their work or place hyperlinks to the work and activities completed elsewhere. These individualised frameworks would be distributed to learners via a digital class management tool, Google Classroom, which will be an ancillary application in the scope of this study, as the emphasis will be on iPads and the Google Docs framework.

The method consists of teaching all of the concepts for a given year, briefly within the first term (January to April) referencing a local context, South Africa. In subsequent terms they would then be expected to apply the same concepts over and over, practising and learning through action in different reference contexts, e.g. Kenya, in the terms to follow.

The HOD placed an explicit expectation on the educators to use the framework in what Hokanson & Hooper would call "generative" ways:

> *interact with the computer in the manipulation and creation of knowledge through the rapid manipulation of various symbol systems. The value is not in more efficient representation but in improving the capability to generate thought* (2000, p.547).

She wanted the educators to use the framework for teaching Geography. However, she gave no explicit definition of how this was to play out. She relied on the creativity and ability of educators to draw inferences from what they had already learned about ICTs, and that which they were going to learn about ICTs during this process of implementing the scaffolding.

Training

The Geography HOD provided her teachers with a one-hour session of training on the use of Google Docs and Google Classroom. A trainer first demonstrated the use of these digital tools and each teacher then copied the trainer with their own actions. This then progressed to where each teacher created their own version of the framework and made superficial adjustments to practise the use of the tool, with the assistance of the trainer. Some were familiar and some were not, but all responded positively to its proposed use. During the training session, the HOD again stated her expectation that the teachers use ICTs generatively in 2018, guided by the semi-structured framework, and adjusted by them.

During the training sessions, she gave teachers an opportunity to start customising their semi-structured frameworks, while the trainer was present, to give them the opportunity to shape the material in line with their own beliefs and practices, while having a knowledgeable coach at hand. She also continuously attempted to convey her ambition and inspire the educators in her department, by asking them to challenge their preconceptions and pedagogic beliefs. She expected educators to adapt the framework to their pedagogic requirements while maintaining a minimum level of expected ICT use, prodding them to change.

Reason and Method of Change

This case presents the features of an attempt at innovating the tools and methods that teachers use to teach by suggesting and attempting to scaffold more generative uses.

Yim et al (2016) investigated how Google Docs was integrated into a secondary school setting. The adoption of the tool by teachers was mostly impacted by professional development and collaboration between peer teachers. They note that the sustaining force behind the integration was the authoritative figures' "continuous efforts to create a shared vision and to encourage collegiality and collaboration" (p. 6). Adrie et al. (2017) agree that there is potential within the affordances of creativity and collaboration for ICTs, specifically such as Google Docs, to be of value within a method like this. So, to arrive at the point of teachers' generative use of technology, it is necessary to discuss the take-up of new technologies by teachers and how they come to use it effectively. Miller, Naidoo and Van-Belle point out that an educator will only take up ICTs if they

perceive “a culture and expectation for the use of ICTs in their teaching” (2006, p. 1), similar to the expectations created by the HOD.

For ICTs to be successfully introduced into teacher practice, Ertmer found that when “considering ways to change teachers’ practices, particularly their uses of technology … [it] is impossible to overestimate the influence of teachers’ beliefs…” (2005, p. 36) and that “social and cultural norms, appear to have some potential for altering teachers’ beliefs” (p. 36). This refers to their pedagogical beliefs about educational technology - what they deem to be valid pedagogy. Windschitl in Ertmer states that a teacher is likely to apply a methodology if they believe it to be a valid method of teaching, i.e. if it conforms to their image of what is “proper and possible in classroom settings…” (2005, p. 36). Thus, they will adopt a particular technology if they believe that the technology or method (or both) is valid. In this view a change of belief precedes use. He continues that “... the challenge becomes one of finding the most effective ways to alter these images”. However, Guskey notes “that change in beliefs follows, rather than precedes practice, and that by helping teachers adopt new practices that are successful, the associated beliefs will also change” (in Ertmer 2005 p. 32). Here, a change in belief follows successful use. Whether belief needs to change before a teacher will attempt to adopt any kind of technology or whether a teacher would adopt technology and then have their beliefs altered through success, is a point of contention and potentially presents two paths of adoption, or two points on the same path.

The teachers in this context are placed in a position where they have to use technology; it is being placed in their hands. They have had the opportunity to use it in the past and

it was not adopted. A change of belief, now, during their use thereof, will affirm that they find the technology method and tool valid, both validating the experience as a good one for themselves and validating the method of scaffolded technology introduction as a successful one. Commensurately, the method faces the risk of not changing the belief of teachers and then, without further investigation, not knowing which element of the process caused this to be the case. The technology may be found wanting in validity of instruction method by the teachers, the method of scaffolded introduction may not be effective, both of these could be the case or other factors may be at play. It is necessary to take note of this in terms of potential successes and failures of the introduction.

Freedom in Curriculum

Becker (in Ertmer, 2005, p. 25) adds a third condition for the effective integration of ICTs into education: teachers should have freedom within the curriculum. The boundaries of "curriculum" will vary from being synonymous with syllabus to a more succinct definition: "a set of proposals indicating how this subject matter is to be organised, the educational purposes it serves, the learning outcomes it is intended to achieve and the methods by which such outcomes are to be evaluated" (Carr, 1993, p. 5 - 6). The way that a teacher selects and sequences content, sets educationals goals, and chooses a pedagogical method to employ them, seems to be implied by Carr's succinct definition. The teacher must therefore possess power over selection, sequencing, pacing and evaluation. The tension between how much freedom a teacher needs and how much freedom is available is a negotiated one, as there are common outcomes that must be attained, but each teacher is the eventual gatekeeper of what enters into and happens in

their classes. This freedom is negotiated against the responsibility to fill it with decisions about selection, sequencing, pacing and evaluation. The distribution of freedom and responsibility makes up part of the specific culture at specific schools, and could be different to various levels. The HOD provided the teachers with the freedom to change the framework to suit their requirements for validity and creativity. However, the expected use of specified technologies she placed on them assumes the responsibility that takes away educator choice, ie. freedom. It is important to note that it will potentially come down to individual teachers' perception of freedom within this context to fulfill this requirement.

Problem Purpose Statement and Research Question

This research set out to investigate the take-up or resistance of a technological innovation by Geography teachers at a Private Secondary School in the Northern Suburbs of Johannesburg with ample access to digital technologies, including iPads. I shall elaborate on this in the next section. The original aim of the research was to do a case study to investigate teachers' take up of a new technological innovation. However, one of my preliminary findings was that the teachers did not or negligibly took up the most innovative aspect. I therefore became more interested in why each teacher resisted.

My main research question is:

Do teachers take up the technological innovation and if so, why?

Sub-questions:

1. Did they make changes to the framework?

2. If so, what changes did they make and why?
3. What role does autonomy play when a new technology is prescribed?
4. Did the technological innovation have an impact? If so, what was it?

Further research objectives:

1. The relationship between their pedagogic beliefs and ICT use.
2. The relationship between their pedagogic belief and ICT use, and their curricular freedom.
3. Their use of technology as object or means.
4. Contextual issues that arise while adapting the framework to suit their pedagogy.

The investigation of the above question and the key issues led to interesting discoveries. When I first started to investigate I found that the teachers chose to adopt the agreed-upon curriculum and pedagogy, but did not adopt or adapt the framework and only incorporated ICTs on a representational level - therefore my research question became:

Why did teachers resist taking up the technological innovation?

In the next chapter I introduce a review of the literature to situate my study in the field and to introduce issues, themes, concepts and considerations that informed the design of my empirical study.

CHAPTER 3: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

There are strong claims that technological tools add pedagogic value through their affordances. The aim of this chapter is to situate my study in the field and to introduce issues, themes, concepts and considerations that underlie these claims. In order to discuss how technological tools can add pedagogic value I shall explore concepts and their relationships that underlie these claims. I shall begin by looking at the concepts of technology and pedagogy. I shall then explore what affordances are, specifically in relation to their availability to teachers' instructional design. It is through affordances that technological tools practically enter the pedagogic process. When discussing how teachers gain access to technology to leverage it pedagogically I shall look at two concepts. I shall look at Technological, Pedagogical, and Content Knowledge (TPCK) as an acknowledged structure of that which is required by educators and various models of technological knowledge progression. I look at the acquisition of technological knowledge itself by distinguishing between knowledge as object and knowledge as means in order to illuminate the progressive levels of knowledge that are reliant on one another. In exploring the role that autonomy plays when a new technology is prescribed I address regulative and instructional discourse as it relates to educators as learners - in this case, of new technological knowledge in order to use it pedagogically. I then investigate the nature of the potential barrier that teacher regulation and prescription presents when it conflicts with educator autonomy and past practices.

Technology and Pedagogy

To establish the relationship between technology and pedagogy it is necessary to first explore these concepts separately, before seeing how they fit together in my pursuit of applying these concepts further. Social structures and processes, knowledge, educational technology and, by implication, pedagogic discourses and practices, are not static; they are "essentially the product of a great historical stream consisting of trial and error, long practice and imitation, and sporadic manifestations of unusual individual creativity and persuasion" (Saettler, 2004, p. 4). This developing nature of society includes the development of pedagogy, defined by Alexander (2009, p. 928):

the observable act of teaching together with its attendant discourse of educational theories, values, evidence and justifications.

So pedagogy is comprised of both intended and enacted tasks, activities, interactions and judgements a teacher makes in and of their practices, directed in their context of practice at a learner through a learning experience. What an educator does to perform the tasks involved in teaching and the knowledge and beliefs that ground their planning and practice, and the judgements they make, serves to direct inquiry into pedagogy. In other words, a study of pedagogy must go beyond the study of *the what* and *the how* of teaching to include *the why* - educators' beliefs and motivations.

Communication is central to all forms of teaching aimed at mediating knowledge. Bernstein identified three main systems of communication or "message systems" in education as curriculum, pedagogy and evaluation (Bernstein, 2003, p. 55). Laurillard

developed a communicative framework that identifies the points at which technology can be integrated into pedagogy through communication (Laurillard, 2013). Contemporary manifestations of educational technology tend to be ICTs that facilitate these communication processes with the general goal of *enhancing* student learning (Williams in Wang and Woo in Ndlovu, 2016, p. 40).

Technology, being "a system of practical knowledge not necessarily reflected in things or hardware" (Saettler, p. 1), is not only attached to the modern concept of digital tool, but also to the user or the mind behind the use of such a tool: a craftsman, artist or teacher. Inquiry into educational technology, so far as it encompasses the actions of the mind should therefore inspect teachers' beliefs expressed in their accounts and judgements of what counts as educational theories, values, evidence and justifications. This should be done in terms of their espoused and enacted uses of technology, their pedagogy, including the impact thereon based on what the educator deems to be knowledge, teaching, learning, and its validity as part of pedagogy.

Educational technology is further defined as a process wherein knowledge is applied systematically to instruction (Saettler, 2004, p. 2). Within the South African educational environment, in the past few years there has been a national push within both private and public schools to introduce educational technology into schools. This drive is grounded in an assumption that it will improve teaching and learning practices (Department of Education, 2004, p. 15 - 20). Both tools and methods are included in a process of systematically applied knowledge, but could be applied in various ways. However, the drive towards the use of digital tools should not be for the sake of using

contemporary technology, but rather the emphasis must be placed on the appropriate and effective use of these tools. Appropriate and effective use refers to use that improves teaching and learning practices - pedagogy. These various uses stem from the operations to which they allow (or constrain) the user. Some of these uses are uses as originally intended, but some are also creative uses based on their inferred application rather than explicit intent in design: their identified "properties that determine how the thing could possibly be used" (Norman, 1988, p. 9), or not, are the design of its implementation. Therefore the design of implementation of ICTs firstly requires the identification of properties that could yield use to an educator. These are the affordances in both hardware and software that an educator could later choose to leverage. Hardware and software are two discernable elements of digital technology devices, e.g. laptop and desktop computers are discernable from their operating systems, browsers and word processors. While the hardware itself has affordances, the real power of ICTs arguably lies in the *software* and *the ways in which users interface with it* - the way it is used. This makes the hardware and software aspects distinct but inseparable. iPads, which are increasingly being promoted as an education tool, offer hardware and software affordances. Portability, connectivity, and an intuitive nature of use in hardware and its applications (software) allows for use specifically designed with education in mind - these are some of its most valuable affordances.

Affordances

ICTs as part of educational technology offer a range of affordances, through which they operate as part of the educational communication process. Norman defines affordances as "the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used" (1988, p.9). These uses could initially be apparent, but later turn out to be false affordances, meaning the thing cannot actually be used for its assumed purpose. This draws a line between Perceptible Affordances and False Affordances. A further line can be drawn by perceptibility itself: this is where it is not apparent that a thing has a specific use or that it does not. But the awareness of such is established through the perception thereof. For an educator to make use of technological tools, they must then recognise an affordance as apparent but not false, and then investigate it for potential hidden uses or correct rejections (Fig 1.1). Uses of things, or affordances, are revealed through knowledge of the thing and thus their ability to take advantage of true affordances gains potential.

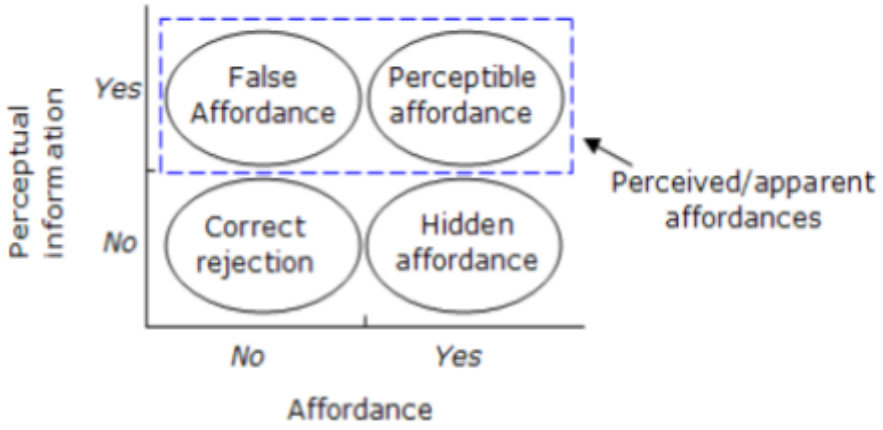


Fig 2.1 A model of perceptual influence on affordances
(Soegaard, retrieved 30 November 2017)

Conole & Dyke (2004, p. 116 - 120) provide specificity in terms of ICTs and affordances in positing a taxonomy of ICT affordances. They offer details on a range of ICTs; however, the focus of the proposed study will incorporate the following ICTs:

Hardware	iPad: Rectangular tablet computer with varying sizes slightly larger or smaller than an A4 sheet of paper. Touch-screen interface. Connectivity to the internet. The ability to connect to other inputs like keyboards and tablet pens.
Software	Google Classroom. Google Docs.

The hardware and software above, interpreted through Canole & Dyke's taxonomy, could present the following affordances:

Accessibility of information and knowledge	
Hardware: Through connectivity to the internet, networks, and other peripherals, the iPad makes it possible to provide access to application. This enables access when information would otherwise be unavailable, as well as comfort of access.	**Software:** Google Classroom allows access to distributed notes. Google Docs provides access to the framework of text with which will be engaged.

Speed of change, embodying Castell's idea of "the information society discourse, where abundant and rapidly changing information is mediated through extensive communication technologies (in Conole and Dyke, 2004, p. 116).	
Hardware: iPads not only allow updates in terms of their own operating system to take advantage of progressing requirements, but also allow access to the App store which provides access to current applications.	**Software:** Google Classroom allows the educator and learners to communicate on a single, large platform. Google Docs allows for the sharing of synchronous information.

Diversity in the sense that ICT "offers access to a vast range of diverse and different experiences that can inform learning" (Conole and Dyke, 2004, p. 117).	
Hardware: iPads not only have accessibility features for the less able, but also allow for the consumption and construction of knowledge in visual and auditory ways.	**Software:** Google Docs offers an array of features that allow for creative and differentiated use.

Communication and collaboration through the "potential for learning enriched by engagement with the 'other'" (Conole and Dyke, 2004, p. 117).	
Hardware: Interfaces such as video display, recording, screen mirroring and peripherals provide the ability to communicate.	**Software:** Google Classroom provides the potential for communication through interactive notices, questions, interactions, and tasks. Google Docs allows file sharing, word processing, and presentation, video, and website editing platforms where synchronous and asynchronous collaboration can occur, while allowing the communication of content with various levels of access.

Reflection refers to the asynchronous nature of many ICTs that provide longer engagement between parties than would normally be the case, allowing for reflection and consideration.	
Hardware: iPads not only allow functionality during connectivity, but also have the capacity to allow limited functionality while offline.	**Software:** Google Docs allows for asynchronous consumption and reflection.

Multimodal and non-linear, meaning there are different routes "through, and forms of, learning" (Conole and Dyke, 2004, p. 118).	
Hardware: iPads allow different methods of consuming (visual and audio) and producing knowledge (visual, and audio).	**Software:** All applications are designed with an ideal workflow in mind. Yet they allow for a variety of functionality and creativity within the various workflows that they allow.

Risk, fragility and uncertainty refer to the changes and the impact that ICTs and people's choices regarding them can have on society.	
Hardware: iPads can be seen by teachers, students or parents as unnecessary, incongruous with certain communities or individuals in terms of cost, or as inadequate.	**Software:** Applications need to be updated constantly to keep up with competitors in terms of features and functionality, and many lack intercompatibility. This incompatibility, the potential learning curves in learning how to work technology as it changes and even cost of applications can constrain use. Again, the incongruence with how applications work and how society expects learners and educators to work may also be a constraint.

Immediacy is the speed at which information can be exchanged.	
Hardware: Allows for auditory, visual and text input at a rapid pace. Connectivity is the only constraint for how fast information can be exchanged.	**Software**: Google Classroom, Drive, Docs, allow instant collaboration and exchange of information within their workflow structures, but are reliant on connectivity.

Monopolisation is a potential boon for the ease of interoperability on a single platform but may also threaten freedom of development.	
Hardware: iPad is a brand that does not allow significant alterations without penalty. The closed system approach constrains user modification, but allows for universality and stability.	**Software:** Many applications use a proprietary document format, e.g. '.pdf' or '.docx' and many online applications use a proprietary portal requiring an associated account, e.g. Google or Microsoft, to enable even certain basic functions. The nature of the information age has caused many of these formats to communicate with one another, but it is still largely proprietary. The anticipated platform of use is Google, which allows many of its affordances through the interoperability achieved within its proprietary structure. Learners will have access to this requisite structure of applications and affordances.

Surveillance is seen in a Foucauldian way as extending the potential of supervisions and control than can be exacted.	
Hardware: Every iPad can be tracked, monitored and identified, for a variety of purposes.	**Software:** Google Classroom allows for strict control of who enter the classroom and to which extent, dictated by the teachers, interactions are allowed. Google Docs allows interaction, e.g. feedback and viewing version histories, by the teacher at any moment. YouTube simultaneously allows privacy and publicity for an account through user choice.

The hardware affordances are limited when compared to the vast affordances of the software, but they provide a platform for the intricacies of software affordances. Each application is multifaceted and can be implemented in a variety of ways depending on educator affordance awareness and design. Educators can consider these affordances when they enter their perception and it will impact their application of pedagogy when they add it to their considerations during the design process. In a study of the individual and collaborative composing affordances of Google Docs, Hocutt finds that, as a basic word processor, Google Docs is capable and easy to start using due to its visual similarities to other word processors. A clear affordance presented by Hocutt is that "Google Docs excels in sharing and collaboration" (2014). He concludes that Google Docs supports the outcomes of creating communities of inquiry that integrates cognitive, social, and teaching presence, providing low-stakes, student-centred composing opportunities and engaging student and instructor feedback, reinforcing critical and liberatory pedagogies and teaching and exemplifying meta-cognitive reflection on the technologies themselves.

Different affordances of Google Docs have been identified previously (Mzivko, 2013):

1. basic affordances: “enable easy creation, storage, sharing and collaboration of” documents.
2. social affordances: “collaborative work… modify text together and left some notes on margin for others to find”.
3. cognitive affordances: “possibilities of writing, interaction with others, reworking text, … reflecting on your own thoughts and other related activities”.
4. emotional/motivational affordances: which are seen as a result of rich affordances mentioned above, evoking emotional affinity with ease of use.

Technological, Pedagogical, and Content Knowledge (TPCK)

Affordances allow the entry of technological tools into the instructional design of teachers. This instructional design is reliant on various knowledge acting together in order to create effective instructional events. TPCK makes the aspects of this knowledge explicit and the shown models of ICT Integration illustrates the knowledge development as determined by its use.

A conceptualisation of knowledge which is specifically aimed at the use in educational technology is the concept of Technological, Pedagogical, and Content Knowledge (TPCK). Due to my focus on educator take-up choices, I need to acknowledge that educator action occurs on a professional knowledge base, defined by Shulman (1987, p. 8) as Pedagogic Content Knowledge:

the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organised, represented, and adapted to the diverse interests and abilities of learners and presented for instruction.

CK: teacher knowledge about the subject content being taught.	PK: methods, strategies and practices involved in teaching.
PCK: "the transformation of the subject matter for teaching," by the teacher based on how "the teacher interprets the subject matter, finds multiple ways to represent it, and adapts and tailors the instructional materials to alternative conceptions and students' prior knowledge." (Mishra & Koehler, 2006, p. 64)	

The addition of TK to the model obviously seeks to explicitly include how teachers interact with educational technology in addition to PCK "to produce effective teaching with technology" (Mishra & Koehler, 2006, p. 62). How content (curriculum), pedagogy (teaching and learning processes and methods), and technology (traditional and contemporary) relate to one another is complex and nuanced (p. 1025), as the affordances and constraints of technology impact content and pedagogy. Technological knowledge, the ability to "understand information technology broadly enough to apply it productively at work and in their everyday lives, to recognise when information technology can assist or impede the achievement of a goal, and to continually adapt to changes in information technology," (Mishra & Koehler, 2006, p. 64) points to the acquisition of an educational technology knowledge and the ability to apply it appropriately within a knowledge system, i.e. how to 'work it' as well as how to identify

the opportunities for appropriate use within the pedagogical and content contexts. Acquiring

> *TK in this manner enables a person to accomplish a variety of different tasks using information technology and to develop different ways of accomplishing a given task. This conceptualisation of TK… sees it developmentally, as evolving over a lifetime of generative, open-ended interaction with technology.* (Koehler & Mishra, 2006, p. 64).

Technological Content Knowledge (TCK) is how subject specific content and ICTs jointly enable and constrain one another, e.g. "[t]eachers need to understand which specific technologies are best suited for addressing subject-matter learning" (Mishra & Koehler, 2006, p. 65).	**Technological Pedagogical Knowledge (TPK)** is how the methods, strategies and practices of teaching could change with the introduction of new technologies, managing their affordances and constraints.
Technological, Pedagogical, and Content Knowledge (TPCK) is a synergy of the constituent components, where educators frame how they provide access to knowledge and procedures, simultaneously considering representations they are making, using the methodologies that are most appropriate, by taking advantage and being aware of affordance and constraints of the hardware and software they employ. This lends itself to being flexible and situational,as teachers should apply themselves and this new form of knowledge.	

TPCK Development

Koehler & Mishra (2009) argue that if teachers want to take up technology there could be possible barriers and propose ways to circumvent them (Fig. 3.1). They point out that where teachers are learning new technological tools and trying to integrate it into their practices simultaneously (new PCK and new TPACK) there may be cognitive overload, and they propose a particular method to overcome this. This insight is important to my study as the teachers in my study are following a process of simultaneously acquiring PCK and TPACK, as the method and tools (iPads and Google Docs) are new to them as individual technology and as joint tools.

Developing PCK and TPACK simultaneously	Teachers gain experience and knowledge through projects that require them to define, design, and refine solutions for learning problems and scenarios. The design process serves as the locus for activities that produce insights into the ways technology, pedagogy, and content interact to create specialised forms of knowledge (see Mishra & Koehler, 2006; Brush & Saye, 2009)

Fig 3.1 Approaches for developing TPACK
(Model by Koehler & Mishra 2009)

On the development and adoption of TK, multiple sources suggest that the development of teacher knowledge in terms of ICT adoption moves along a progressive track. Wilson-Strydom (2005) conceptualises this adoption on a cline based on a report on ICT curriculum and teacher development for schools by UNESCO in 2002, progressively as:

1. Emerging: access to ICTs is gained and the possibilities and consequences for management and teaching are explored. Teaching still happens in a traditional teacher-centred approach, but there is an awareness of the presence of ICTs.
2. Applying: ICTs are used to do tasks that were traditionally done. Teachers still mostly dominate the teaching space, but the curriculum is adapted to increase the use of ICTs.
3. Infusing: a range of ICT-based technologies are used across classrooms. Teachers explore ways that ICTs are shaping their personal practices and productivity.
4. Transforming: ICTs are used to rethink school organisation and structure. Teaching is learner-centred and subject boundaries reflect real-world situations and applications. ICT is a separate subject at a professional level and is incorporated in other subjects.

Hennesey & London argue that pedagogy will not change due to the introduction of new technological tools, that "the power of using technology in the classroom relies on the premise that technology is integrated into the existing pedagogy" (2013). This suggests that the easiest adoption strategy of new technology is to integrate it into current pedagogy, and use potential developed familiarity with the technology to leverage new affordances. However, Culen & Gasparini recognise that a review of a teacher's pedagogical approach "is also necessary in order to take into account new issues arising during multimodal interactions and collaborations" (2012). This suggests that some technologies cannot replace older technologies in similar pedagogies, ie. cannot serve as representational tools, as their affordances are too different. This would then require

new pedagogy to take advantage of different affordances. Teachers may then learn from the new affordances that iPads provide and "modify and redefine student learning by employing transformative pedagogical models, and … the exploration of new pedagogical approaches" (Goodwin, 2012). Thus, adopting technology leaves room for the possibility of transforming pedagogy after transformative technological tools have been introduced. This supports the view of changing the tool before the method. It is therefore plausible to introduce technology on a representational level first (UNESCO's Emerging and Applying). At this level the pedagogy of educators will still function, but they are acquiring technological knowledge. Once this has improved, they will become aware of and be able to make use of its additional affordances and potentially use the technology generatively (UNESCO's Infusion and Transforming). However, it is clear that a situation may arise where a new tool seems inferior to a previous tool during initial representational use, but will be superior during further representational use.

Technology can therefore enter pedagogy at an initial level of use: as a replacement or substitution of current technological tools, sometimes identified as the emerging or recognition stages of technology integration. As educators gain more knowledge, additional affordances that the substituted tool do not possess are revealed and these additional affordances are used to amplify or enhance lessons, sometimes also identified as applying, infusing, accepting, adapting, exploring, augmentation or modification. New pedagogies are suggested to be revealed when educators rely mainly on these additional affordances to transform their lessons, a process that is also termed advancing or redefinition. These terms have been taken from various authors who broadly concur with the progressive developmental concept towards generative or transformative use of

ICTs. Different theories by various authors are comparatively represented in the table below to illustrate the progression from left to right:

UNESCO (2002)	Emerging	Applying	Infusing	Transforming
Puentedura's SAMR model (2006)	Substitution	Augmentation	Modification	Redefinition
Hughes' RAT model (2006)	Replacement	Amplification		Transformation
Niess (2011)	Recognition	Accepting and Adapting	Adapting and Exploring	Advancing

Table 3.1 Comparing Different Development Models of ICT Integration

These models provide us with various descriptions, but are similar in their nature as progressions. Representational (meaning functional) and generative uses of ICTs are distinguished by Wilson-Strydom. With representational use there is "more likely to be learning about computers than learning with or through computers" (Jonassen, Peck & Wilson in Wilson-Strydom, 2005, p. 75) similar to Winsch's (ibid) concept of how-to knowledge, but this is now leveraged to reach a substitutive level of teaching. Where generative use is concerned "teachers' use of ICT become more generative as they start using ICTs to generate thought" (Hokanson & Hooper in Wilson-Strydom, 2005, p. 75). During this transforming stage, "ICTs would hopefully be both individually and socially integrative" (Wilson-Strydom, 2005, p. 75), meaning that knowledge can be individually and socially constructed using ICTs in an assistive way.

TPCK & Affordances

Educators make decisions and enact practices explicitly from this TPCK knowledge base. Their pedagogical reasoning and action follow a sequence of: comprehension, transformation, instruction, evaluation, reflection, and new comprehension (Shulman, 1987, p. 15). This provides us with a basic understanding of a general pedagogic sequence that a teacher follows - the process that must be completed for it to be said that teaching has happened. The introduction of ICTs into this sequence initially disrupts its application. Laurillard, reflecting Bernstein's concept of education consisting of message systems, developed Shulman's pedagogical sequence into a communicative sequence, her conversational framework (Fig 3.2). This conversational framework conceptualises a complete teacher's and student's communication practices in the process of instruction. Where all of these communication steps occur, it can be said that teaching and learning have happened: the teacher's conception is matched with the student's conception, clearing up any misconceptions (like false inferences and assumptions) - I term this phase the concept negotiation phase (steps 1 - 4). Thereafter, in a teacher-adapted environment, the student then interacts with the teacher through actions and feedback - what I like to call the learning regulation phase (steps 5 - 9). Both educator and student then reflect on their interactions and experiences - what I refer to as the reflective phase (steps 10 - 12).

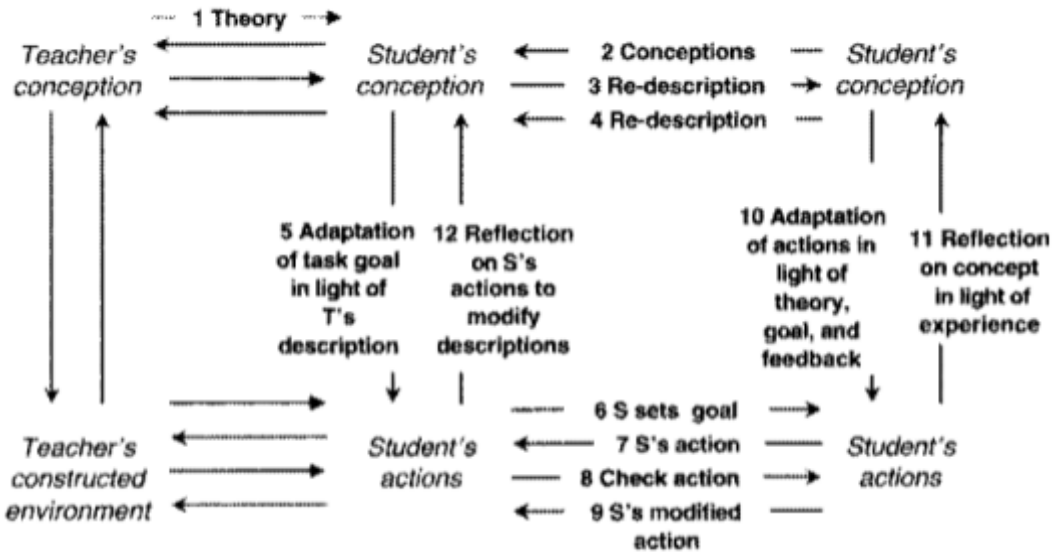


Fig 3.2 Laurillard's Conversation Framework interpreted for learning through lectures (Laurillard, 2013, p. 86 - 90)

Laurillard (1993) posits that the use of ICTs is to afford the entry of media into the conversational exchanges of learning experiences, into language. This is accomplished by using ICTs (ie. digital tools) as tools of communication. My focus in this interaction is not on the learner but on the educators who design, implement and manage this process. In this study it is useful to realise, explicitly, the points of entry of affordances of ICTs within a pedagogical process.

Within her conversational framework, a complete cycle of conversational exchanges constitutes an effective pedagogical exchange. When an educator then uses an ICT in their pedagogical process, it will enable one or more of these conversational exchanges. Within these ICT-enabled conversation exchanges, the affordances of ICTs are accessed and exploited. If the educator does not have the knowledge of how to use the introduced ICT, or is unaware of the affordances of ICTs, they will be unable to use it effectively as

a communication tool. This leaves room to investigate the tension that exists between the affordances of known technologies and the exploitation of seemingly greater potential affordances of unknown or new technologies. The communicative technologies that they choose to use or choose not to use can provide insight into their pedagogical process preferences and reasoning.

Technology As Object and Means

The knowledge of a thing, the knowledge of how a thing works, and the knowledge of how to use a thing for something specific are all different kinds of knowledge. In this chapter I explore the sequence in which these kinds of knowledge can be acquired. This is significant because the acquisition of technological knowledge will first occur at the levels described in this chapter before it will present itself practically and be measurable by ICT Integration tools, like those mentioned in the previous section on TPCK Development.

Tension exists between technology as object, 'how it works', and technology as means, 'how to work it' when introducing a new technology. The "it" in this case is the hardware and software of ICTs, and educators need to understand the affordances and constraints of both of these aspects. For a technological tool to be a means, it must first be known as an object, i.e. for educators 'to work it' they must first know 'how it works'. Winch introduces three different kinds of knowledge acknowledged by epistemologists: 1. knowledge by acquaintance, 2. know-how and 3. propositional knowledge (2013, p. 128). Knowledge by acquaintance is often associated with a sensory encounter and is valuable because this knowledge can only be gained through

experience with the object. Examples of this are experiencing the physical feedback of typing on a keyboard, or the lack thereof when tapping the screen of a tablet computer; it is also experiencing the visual feedback from working with an iPad application based on which designated areas you interact with. This is the foundation of knowledge for our interactions and use of tools. Without this knowledge, affordances enabled by the technology are lost to us. "Know-how"-knowledge or *the knowledge 'of'* technology is knowing how it works. Knowing that it is something or that it is not something places technology as the object of learning. The know-how of technology is crucial as "one cannot understand, and *a fortiori*, cannot have knowledge of the content of a proposition unless one can understand the inferences that can be made from and to it, and can articulate at least some of them" (Winch, 2013, p. 130). Where the technological tool is the object of learning, its affordances are being discovered and learned, i.e. how a specific application or a function within such an application on an iPad might work. This know-how of a technological tool is a prerequisite for using the technology tool as a means.

For simpler tools, know-how proceeds innately from acquaintance knowledge: "if I instruct a child to use a pair of scissors, the aboutness of scissors, their cutting function, is revealed in the actions the child performs… their functional structure or working, embodies their design… a projection of the consciousness of the designer whose purpose is to make an object or instrument that cuts" (Miller, 2011, p. 395- 399), i.e. 'how it works'. An iPad has a functionally strong hardware structure where tapping on a screen is embodied in the design - it is an object or instrument that is designed to function by being touched. The simplicity of learning the aboutness of iPads may lead

observers to conclude that learners know how to work iPads, but they are merely acquainted with them.

This acquaintance knowledge allows for the explorative or directed acquisition of know-how. The subsequent know-how allows for the awareness of affordances and their use in propositional knowledge as "knowing how to do something usually requires some elements of the other two kinds of knowledge" (Winsch, 2013, p. 131).

> "[Knowledge how] is not merely a matter of skill, or the practice of technique… Such activities as planning, communicating, assessing and coordinating depend on the prior grasp of skill because they are ways of carrying out various kinds of activities that themselves require skill" (2013, p. 133).

Knowing how is thus the planning, communication, assessing and co-ordinating activities with the incorporation of an iPad's application or hardware affordance. *Knowledge how* further extends to the concept of expertise, which relies on the addition of content. Expertise is the *inferential relationship* between knowledge by acquaintance, know-how and knowledge how. Gaining expertise within a range of content is then manifested by grasping and employing inferences. Gaining expertise is therefore gaining all three levels of knowledge and building inferential relationships between them, incorporating it into the system of applied knowledge which is education technology.

Control and Freedom

Being a "learner" is conceptually being placed in the position of someone acquiring new knowledge. In the case of educators gaining new knowledge (i.e. learning how to use iPads or Google Docs) they are the learners. They too experience regulative and instructional discourse in the active acquisition of knowledge in the process that the HOD designed for them and throughout the period that they used the tools. This section describes how I shall investigate the impact of such discourses on their autonomy and motivation to change.

Access to scientific discourse (i.e. content, curriculum) by learners who enter the educational system to attain it, is provided and potentially prohibited through pedagogical discourse. Pedagogic discourse is constituted by instructional discourse, "the transmission of skills and their relation to each other" embedded within regulative discourse, "the school's (or any institution's) public moral practice, values, beliefs and attitudes, principles of conduct, character and manner." (Bernstein, 1977, p112). Instructional discourse is located within regulative discourse as it is the latter that allows the former to occur. This is exemplified in Hardman, where an educator's highly regulative discourse limited the instructional discourse and subsequently the affordances of ICTs, "with the teacher restricting the kinds of actions students can perform on the computer by rigidly controlling the pacing, sequencing and selection of content studied" (2005, p. 10). Hoadley (2006) encounters this phenomenon as well, to the level that instructional discourse is entirely inhibited. What teachers do, do not do, say and do not say are manifestations of their pedagogic discourse. Not only can regulative and

instructional discourse be gleaned from this, but we can also learn a great deal about the 'how' of their pedagogy. Teachers' freedom within the curriculum can be interpreted as their control of the curriculum and what they do. This is natural, as teaching and learning are directed social activities; removing an educator's freedom to direct removes their agency, authority and subsequently their role as Expert. If this is gone there is no need to gain Expertise and also no need for a teacher to be there. A structure cannot function without its agents, as it will then be no more than procedures with no one to carry them out. The tension between framing and regulative discourse, and pedagogical discourse, is that control should be in the hands of the educators, but they must then seek balance between the regulative and pedagogic. Instructional discourse is an affordance of regulative discourse and framing that must be initiated and maintained by the educator. Similarly, educators operate within the regulative discourse of their environment, e.g. their department or school regulations or instructions. Freedom within the curriculum then extends to mean a degree of teacher autonomy within their context. When the regulative discourse that educators operate within then stipulates a change, tension is created between teacher autonomy and teacher regulation, which can then impact on their perceived freedom of curriculum as critical success factor of successful technological adoption.

Teacher Belief and Change

Teacher belief can be divided into teacher beliefs about pedagogy and teacher belief about ICTs, in order to differentiate the incorporation of a new technological tool or pedagogy into their teaching practices based on what they believe. These beliefs directly

relate to the acquisition of TK, PK, and TPK in conjunction with changes in adoption. The main tension identified in this study is in the relationship between beliefs, actions (adoption) and knowledge. In this section I shall explore how teacher beliefs can be impacted, in order to change their actions.

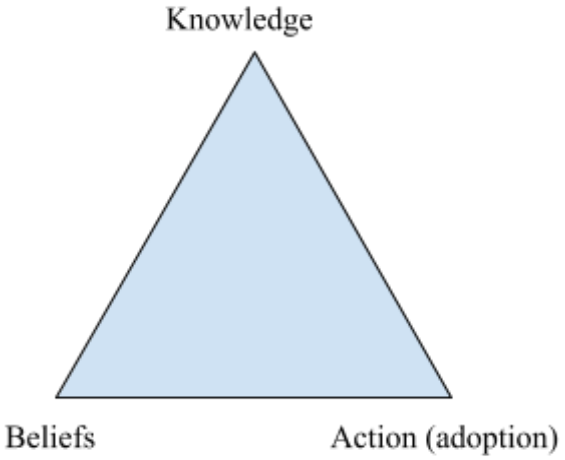


Fig 3.3 Tensions in the introduction of ICTs

In considering why teachers would change their practices, Ertmer (2005) posits two potential ways to alter the belief that teachers have about appropriate teaching. The first of these has already been addressed in creating an expectation of use. I posit that this culture can either be motivational or enforced and its consequential impact as motivation or not is a factor in the choice to incorporate ICTs or not. Teachers will only use ICTs if there is a perceived experience that they have no choice, or that it is their choice to do so. These encapsulate Fuda's reasons that people change: either with the motivations of "burning ambition" or "burning platform" (2013, p. 6 - 7). This creates contextual differentiation between a culture of ambition to change - they want to, or an expectation of required change - they have to. Potentially and quite likely, the former

will be met with enthusiasm and ownership, internal motivation will then drive teachers to seek out innovations independently and this merely needs to be steered. The latter will be met with resistance and possibly resentment, which require far more effort and external motivation not only to get going but also to maintain. Every change or adjustment will be resisted, because they lack ownership and therefore they will not perceive changes and adjustments to be in their best interests.

The second reason educators would choose to change is through "personal and vicarious experiences". Hart & Laher agree in their findings that teachers' perception of utility, not only access and ability, greatly impacts their adoption of the technology (2015, p. 1). In terms of personal experiences, Guskey is noted as arguing "that change in beliefs follows, rather than precedes practice, and that by helping teachers adopt new practices that are successful, the associated beliefs will also change" (in Ertmer 2005 p. 32). Changing teacher beliefs in order to cause adoption is therefore a backwards conceptualisation and relying on beliefs to change before successful personal experiences may never occur. This requires a minimum level of use that forces teachers to adopt and potentially gain these successful personal experiences without requiring belief beforehand. This is an incremental occurrence as suggested by the existence of developmental models, meaning knowledge also provides some form of belief or motivation. This leaves reason to explore the relationship between knowledge, action and belief. There are also elements of belief that are bound to remain intact after belief about the to-be-adopted technology has started to change, if it has. To achieve this belief change through direct experiences, it is recommended that 1.) one questions one's own practices and the practices of others, 2.) one makes assumptions explicit, and 3.)

one uses classrooms as sites for enquiry; this approach will foster "fundamental changes in deeply held beliefs, knowledge, and habits of practice" (Windschitl in Ertmer, 2005, p. 33). Vicarious experience is also supported in literature for technology-orientated professional development. It is the experience of the efficacy of technology through the actions of someone else and is seen as effective because "models can not only provide information about how to enact specific classroom strategies, they can also increase observers' confidence for generating the same behaviours" (Ertmer, 2005, p. 33), potentially allowing successful pseudo-direct experiences that can impact beliefs, again adding to the gradual change. However, as far as confidence is an element of belief, this means that belief can change prior to action and that the relationship between change in belief and change in action is more of a cyclical one, facilitated by knowledge and experience. Through the advancement of competence towards Expertise a change in belief can come about, and in this case belief lags successful use. However, through vicarious experiences, motivation and belief rather than action change, leaving a change in actions to lag a change in belief.

Educational technology is not limited to technological tools but is also a system of applied knowledge. When this system is designed and applied to tasks, activities, interactions and judgements by a teacher, and directed in their context of practice at a learner through a learning experience, then pedagogy becomes enhanced by educational technology. This system is enacted through communication sub-systems wherein technological tools facilitate or enhance the communication process through their various affordances. Educators become aware of and adept at exploiting these affordances, and thus the education tool, by gaining knowledge of them. TPCK is a

conceptualisation of different kinds of knowledge that are required by educators for the purpose of using technological tools effectively in their practices. Knowledge by acquaintance, know-how, propositional knowledge, and expertise are a conceptualisation of knowledge of a tool, tiered in complexity, that allow the educator access to the awareness of their affordances and their use. When a new tool is introduced into the context of an educator, they not only have to contend with their knowledge acquisition regarding that tool, but it also has an impact on their perceived freedom or teacher autonomy. The tension between teacher autonomy and teacher regulation seems to be resolved on the basis of a teacher's belief of what counts as valid teaching. In changing educator belief, the nature of the culture of expected change can impact their beliefs positively when the educator perceives the culture to be motivational, or negatively when the educator perceives the culture to be enforced. What an educator experiences personally or vicariously as valid or questionable teaching and learning practices also impacts their belief. The considerations and conclusions of a teacher then result in their making a choice of adopting or rejecting the technological innovation.

I have now described how affordances appear to educators based on their ability to perceive them, which is linked to their knowledge of the particular technology. I have explored how technological knowledge is acquired, progresses and translates practically into pedagogic value. I have affirmed some of the principles that could cause teachers to either resist or adopt technology. These concepts will now serve to address my research objectives and contribute to the discussion around my research questions.

CHAPTER 4: METHODOLOGY

The intended methods of study were applied in order to attain an answer to the main research question: do teachers take up the technological innovation and, if so, why? It is a case study within a bounded system with a particular intervention. The educators did not take up the technology, and my investigation is thus aimed at understanding why they did not.

Ethical Considerations

Through the research, I inquired into areas of work where educators may or may not have encountered success. In this there is always room for them to feel judged, which was not the aim of this study. To protect them from this, they were not only be informed that the study is not aimed at assessing, but also that their identities would remain anonymous. This anonymity would be maintained through all observation instruments and discussions. The intrusion into their teaching and planning processes would be mitigated, to some extent, by the researcher's being a member of staff, and by being mindful of the teachers' schedules.

Within an area of education where teachers feel pressure to use a particular method or tool, and where it has potentially not been used as intended or a different method or tool has been used, it is my imperative that teachers should not feel pressured to say what I want to hear. The aim was to see whether the proposed intervention had any effect and, if there was an effect, what its extent was in terms of pedagogic impact.

Research Method

The research method used will be that of a case study, focusing on the HOD and the Geography teachers. It is necessary to include the HOD as she is the source of the innovation and designed and implemented it. She had a particular outcome in mind and her perspective will add value as an intended outcome. The department was selected as a convenience sample due to its proximity to the researcher, and fortuitously so as the researcher learned of the innovation through informal interaction with the HOD. I was part of the training session held in January and interviewed the respective teachers and HOD after they used the innovation for three months.

The data sources were the original base Google document, provided by the HOD, an interview with the HOD regarding the Google document and its intended implementation; supplemented by the adjusted Google documents of the individual teachers and interviews with them regarding the changes they did or did not make. It is important to note that even though the case study surrounds the educators and their reasons for taking up the technological innovation or not, their beliefs about what counts as teaching and learning will remain a focus throughout. These instruments were devised to apply the case study methodology to investigate the research questions and objectives. Informed by the intentions of this study, the HOD and teacher interviews, Appendix 1, were semi-structured, open-ended, depth-interviews designed per specifications of by Cohen, Louis, Lawrence Manion, and Keith Morrison (2013, p. 271 - 273). It was designed in order to ask questions that simultaneously specifically address the research questions and allow the HOD and teachers to consider their experiences

and beliefs, which are key to the study's purpose. In seeking to investigate the educator's specific pedagogic choices and practices, the study sought to analyse the changes the educators made or did not make to their frameworks based on their beliefs. However, since the educators made no or negligible changes to the framework, the study therefore probes teachers' orientation towards the technological innovation, relying heavily on the interviews with the HOD and educators.

The school Senior Executive Committee, HOD and teachers were approached and consented to the interviews. These interviews were held four months after the educators' commencement of using technological innovation. Interviews were recorded, with the permission of the Senior Executive Committee, HOD and teachers, using the interview instruments, Appendix 1 and Appendix 2. This would allow the interviewee to respond comprehensively and would allow for the situational nature of the questions. These interviews were intended to enable the teacher's reasoning and choices to be compared with the intentions of the innovation. The study aimed to build a case study on secondary school educators' take-up of a technological innovation under the conditions of expected ICT use in a design approach, through interviews, Google document framework analysis, compared to the intended pedagogic change desired by the HOD.

Biographical information, beliefs, experience, and expectations that inform choices and practices were gathered through the interviews. The original, unchanged, semi-structured teaching framework that the subject head designed, as well as the

documents from each participating teacher, was obtained with the requisite permission. The interviews took place at the school at the educators' convenience.

Data Collection and Analysis

Observations of the changes teachers made to the original semi-structured framework in adapting it to their expertise were supposed to provide indications of the pedagogic choices in their take-up of the innovation. However, no changes were made to the framework by any of the teachers, leading to an added layer of ex-post facto data analysis as to why this was so, possibly seeking causal themes with issues they raised, while understanding the individuals' idiographic features. Themes of teacher autonomy at odds with teacher regulation due to a lack of knowledge will be addressed as an unexpected theme. Concurrently, pedagogic choices that were to be gleaned from changes made to the framework will be viewed as intentions for future practice rather than already enacted practices. The interview with the subject head (Appendix 3) was face-to-face, during which her disposition towards her prior and current use of technology was investigated, as well as her motivation behind and implementation of a new technological system. The interview questions, informed by the intentions of the study, related specifically to a description of the approach, her motivation behind it, her process of development, the preparation of teachers to adopt it, and her perception of its implementation at that moment. The interview with the teachers (Appendices 4 - 6) were face-to-face, during which teacher dispositions towards their prior and current use of the framework were investigated. The interview questions, informed by the intentions of this study, related specifically to their beliefs about using the framework in their

teaching practices. Answers will be used to provide a thick description of teachers' dispositions in their adoption of the innovation, based on prior beliefs, experiences and their specific current circumstances.

CHAPTER 5: DESCRIPTIVE INTERPRETIVE ANALYSIS

I will draw insights from the interviews with the subject head and teachers, which will serve to elaborate on beliefs, motivations, intentions and expectations of this technological innovation and to describe a possible shift in belief or not. Data will be presented by individual, conceptually organised following the conceptual framework. Complete transcribed responses of individual interviews are provided in Appendices 3 - 6. The research questions and objectives will then be addressed separately in the discussion chapter. This is particularly important in building an understanding of the ex post facto reasons for their actions and beliefs. Finally, relevant data from each individual is discussed in a descriptive interpretive interpretation to make inferences, to identify patterns, relationships, comparisons and qualifications, and to make conclusions.

Analysis: Subject Head (Head of Department)

The HOD started teaching in 1985 and has taught at five schools. She enjoys the role as she feels one can diversify the subject and she has sought to do so. She sees her job as placing structures in place and monitoring how teachers apply their individual skills.

Affordances and Knowledge

As educational technology is the systematised application of knowledge to instruction, this instruction should occur through the exploitation of educational technology tools for their affordances. These affordances are leveraged for pedagogical value added through a specific method that functions as the design of implementation of those tools. This

method is a pedagogic pattern of communication, which provides the opportunity for ICTs as media forms to be integrated.

She states that it becomes "easier for teachers to show" when they struggle to explain things. She has a positive opinion of technological improvement based on its allowing "quick changes and access" - the affordances of speed of change and accessibility: "you can literally show them while you wait and while you are busy with something else". She also states that technological tools aid the creativity and impulsiveness of some teachers as it allows them to explore opportunities when they do not have to stick to a rigid teaching plan. The HOD's ambition was, she explained, that the educators could learn more about how the method and the tool works while working with them: "...with the idea and hope that they would run with it … make it better or build on it so that it became more exciting and more and more innovative". She wished to "prod people to change the way educators teach for the better," by allowing for an opportunity to change to using digital technological tools. Her expectation of the educators was also for them to "prod kids and provoke them into also using it - to stimulate investigation and exploration of the topic".

For the HOD, the affordance of communication and accessibility, i.e. showing something digitally, is pedagogically more efficient than pure verbal explanation. She values the affordances of diversity, non-linear multimodality and immediacy insofar as it enables teachers to act pedagogically. The HOD knew that her teachers are neither fully aware of all the affordances available to them through the tools, nor possessed the required knowledge levels of the technological tools (hardware and software). However,

she intended for educators to discover these functions through experience and experimentation. She clearly tried to provide a jump-start in using the technological tool while trying not to dictate the specific affordances of which educators must take advantage.

TPCK Progression

The design approach was followed by the department as a whole in discussing and designing the curriculum (selection and sequencing) and teaching method. The method was reworked into a framework, a Google document, by the HOD. The document was to be distributed through Google Classroom. Her intention was to provide her teachers with the opportunity to design for themselves with the new tool. She attempted to provide a tool relevant in modernity that would allow the teacher, the learner and the content to interact. She expressed that she would be "disappointed if every booklet from every child looks the same" because that would reflect that the educators had made no changes to the framework. She acknowledged that this might come about as her framework might have been limiting to some of the educators, as they lacked the skill to operate within the tool and that "maybe my expectation was set too high". However, she has not retreated from the goal of the experiment which was for them to become more familiar with it. Her expectation of Teacher 1 was that her methodology would change to match her criteria; however, "she is still using the old way of teaching, without using iPads". Her expectation of Teacher 2 was that she would not change anything. Similarly, she acknowledged that Teacher 3 was divided across two subjects, and she did not expect major changes from her.

The HOD's decision of designing and distributing the Google document locked the teachers into the tool and consequently into preferred methods of communication (teaching, assessment, etc.). The educators' acceptance and use of the curriculum and method but resistance to the tool can therefore be explained in one regard as a designated tool, rather than freedom in this regard. The TPCK model clearly voices its concern when introducing a new tool and method simultaneously. Even though the HOD is using a design approach, this approach only pertained to the content and methodology. Changing the method is a goal, and the changes in the framework would have reflected success in this regard. The HOD clearly believes that the method goes hand in hand with contemporary technological tools - this is her expressed ambition for relevance in the contemporary Geography scientific society. It may become clear that this is possible, successively and progressively but not simultaneously. In the HOD's mind it is key for lessons to become digitally interactive. I gather from this, along with a comment that "it is not about iPads, but about teaching differently", that "teaching differently" must not only include a change in pedagogic discourse, but must include digital interactivity due to her belief that contemporary technological tools are more valid within contemporary society.

Expected use

The HOD holds the belief that the core scientific principles are taught and practised through case studies and application. Her opinion about paper as a technology she simplifies into one word: "archaic". She feels it is imperative that learners should do scientific work, "using tech". The HOD explicitly established a culture of expected use:

“I'm hoping that they would have taken the idea and actually changed it and actually adapted to their different classes, the different size of classes and that kind of thing”.

Technological tool adoption is a big part of the HOD’s ambition due to her belief that contemporary tools should be used in contemporary times. She has clearly expressed, for herself and for her department, a burning ambition to change. This provided her with the motivation to discuss and design a syllabus within the department, discuss and design a method within the department, and select a tool and draw up a semi-structured framework on it. This was based on her impression that, in her mind, the tool would fulfill the role of technological tool best required for their experiment. The nature of the culture of expected use created in the educators should be explored. In a situation where a burning platform instead of a burning desire was created for them, resistance could be expected.

Curricular Freedom

Part of the training was the iteration of the idea that this document was to be used as a “base of operations for investigations, not a limiting box”. The HOD also expressed her belief in collaboration between educators, and how the sharing of ideas between educators leads to professional development. The HOD asserts that “good” teaching results in learners who are reflective in their knowledge enquiry and “ask themselves questions about the subject” and that they should become internally disciplined, in assimilating classroom regulatory discourse, as they should investigate concepts themselves, without external factors of motivation.

Teachers learning from one another, and adapting something to their context, is an aspect of how she sees an effective teaching team functioning. She believes that the tool and their subject meetings allowed them the freedom for this interaction and adaptation. Even though this is one of the points mentioned for successful adoption, it seems that it has not been happening. When she states, summarily, that a teacher is teaching when they "stimulate investigation [and collaboration] and inspire" she reveals her belief in social constructivism and learner action and involvedness. The word "inspire" almost seems evangelical in her use of it. This clearly depicts her desire to awaken the ambition to learn more about the subject and make this ambition subsistent in learners; while still acknowledging that teacher involvement as guide and more knowledgeable other remains important.

Teacher Belief and Change

The HOD believes that Geography as a subject, "becomes more relevant with the use of ICTs". An ambition of hers, beyond incorporating the method and tool within her department, is to "go paperless". "If you don't use it, it will never become part of your teaching,"; here the HOD expresses her view that use precedes a change in belief and adoption. Everything that an educator does - explanations, media stimulus, and exercises - "(is) there to stimulate learners into inquiry". The HOD expressed a fondness for innovation in her subject's manner of teaching through experimentation. This project was an internal experiment to introduce new technology (method and tool) into her department. She consulted with her department and they jointly came up with the syllabus to be covered and the methodology to be used. She ensured that training

sessions were held on the technological tool to be used, specifically on how it was set up, how to alter it, and how to distribute and manage it. She states that technological tools should “always be used by the teacher as it makes lessons more interesting and it stimulates creativity,” creativity not only of the learner, but also mainly the educator.

The HOD’s aim of going paperless is backed by reasoning that all information is available freely on the internet, but that it lacks structure - meaning intentional design for pedagogic purpose, which is what she strove to achieve with the semi-structured framework; and believed that what she used is the best tool for it. It is clear that she wanted her teachers to function jointly using the technology. She suggests that creativity in design and pedagogy stimulates learning and that she sees stimulating this creativity as one of her roles as HOD.

Analysis: Teacher 1

The teacher is a relatively new teacher, with a year and a half of teaching experience. Her enjoyment in teaching lies in relaying what she has learned and what she understands. She sees the lack of passion in learners, compared to her own, as the main obstacle in education.

Affordances and Knowledge

Teacher 1 acknowledges limited use of the affordances brought to her class through the presence of iPads. She said that she mainly uses the tools to ensure that learners have access to the information. She not only expressed that she does not "trust" Google Docs, she also stated that she only trusts pen and paper, or physical elements, which contrasts to the HOD's point of view that it is archaic and must be done away with. In terms of the learners, she states that paper is "a familiar tool for me and for them," but that the iPad, and how to work with it, was still too foreign for them to use it at the same level of efficiency. She stated that it may yet take them a bit longer to become proficient in the use of iPads themselves. The educator complained that learners were editing her document and that they had to make electronic copies of the documents, whereupon she lost access to their documents. She said that this was a challenge for her and foresaw it to be challenging for her learners as well, based on previous educational experiences teaching the topic.

Interpretation: The main exploited affordance is that of communication and accessibility to curricular content. The teacher successfully conceptualises how the tool

can work in conjunction with the method. She displays a clear requirement of knowledge with iPads and the applications., which shows self-reflection on her own abilities. By saying that she does not trust it, she implies that she cannot rely on her knowledge of how it works enough to be sure that it will work in the way she designed it. Indeed, she may have struggled silently during the design phase or did not participate in it, which is more likely considering the fact that she did not change anything. Not only did she lack the knowledge, but she also lacked the experience in gaining proficiency or expertise with the new tool. Through her statement that the use of iPads and the applications would result in less efficient use, it is clear that the affordances, also under her own admission, were hidden from her. This contributes to the thought that awareness of a complex tool's possible operations can only be gained through experience with it. The educator clearly espoused a necessity for this knowledge within herself and her students. She was not able to teach these learners the how-to of technology that she foresaw them lacking, because she did not know "how to". The solution to her copying problem was a process specifically covered in training. During training she was potentially suffering from cognitive overload or the training was insufficient to establish that procedure as possible to her. She is clearly confident in her knowledge "of" and "how to" use non-digital teaching media, resulting in her choice of maintaining the validity of what she sees as teaching through their use and the rejection of ICTs. Even though the educator embraced the method conceptually, she experienced challenges when concepts that she previously taught over a longer time frame and with more detail had to be taught in less time, with the aim of learning the finer details through future practice. Through more experience the teacher may gain the critical

nucleus of what to teach in order to facilitate the time frame and the ability to rely on future lessons for progressing with the concept. When she states that it may take them longer to get there, she shows awareness that the process should be refined, which reflects a positive attitude towards its continued use. She had agency in this regard already - the finer details involved in the sequencing and implementation of the method were up to her. When faced with two new technologies that should function together, the educator abandoned the one that she felt would impede her work efficiency; however, she still adopted the one for which she expressed enthusiasm. She believed iPads would hinder her work because she (and the learners) did not know them well enough, even though they were more pervasive in the context of the school. In contrast, she believed the method was valuable enough to adopt and maintain even though her experience with it was less than the iPads and the applications. It seems likely that other contributing factors to her non-adoption of iPads were when she was faced with lack of knowledge and cognitive overload, as she chose to abandon one and adopt the other. This is potentially due to a better understanding of how one worked, a greater ambition to succeed with the method than the tool, and potentially the lack of an alternative acceptable teaching structure. The latter factor points to a potential difference in strength of expectation in the adoption of the tool and the method.

TPCK Progression

The educator states that she values the learners doing research and learning to differentiate between valid and worthless information. The educator states that she believes that the Geography academic society relies on technology, “especially in my

University years, we really used lots of technology we depend on". She also states that "iPads are a distraction because they don't listen to me and they play games and there is no way for me to control it". Her ability to match affordances with pedagogy is not absent as she states that she enjoys pairing appropriate technological tools with appropriate skills. She commented that Geography often lends itself to "old-fashioned" skills, requiring old-fashioned tools.

Teacher 1 presents awareness of the difference of presenting learners with curated information, or asking them to do research and curate it themselves as part of the scientific research process. Her aim is to instantiate the scientific method as an object of learning, even if it is simplified. The teacher displayed an emerging level of technological knowledge in respect of iPads and Google Docs and, due to this, she was unable to see the hidden affordances that she required in order to pursue the aim of teaching the scientific method using those tools. Even though she does not present an absence of technological knowledge, her level of technological knowledge did not allow her to achieve the technological pedagogical knowledge required by the HOD's framework. She states that iPads not only hampered her pedagogic discourse with the designated technological tool, but also frustrated her, adding to her abandonment of the tool. This also provides an indication that the educator is not averse to teaching with digital technology - where she trusts the tools. She even points out that the most useful tool in her subject area in higher education is a digital tool. However, even though a similar tool is available on iPads, she does not use it. Or potentially more aptly, she can not use it, because she does not trust her knowledge of the tool that provides her access to it. She does not have sufficient knowledge of the iPad and the application she refers

to, Google Earth, as objects. If, in her view, the modernity of a skill is linked to the modernity of the tool, then her view of pen and paper tools as better that iPads and applications is not surprising.

Control and Freedom

Expected use

The educator initially tried using the technological tool, but fell back on familiar tools i.e. tools that she "trusts". She acknowledges and recognises that the technologies (the tool and the method) are something she wants to use, but "[I] couldn't do it the way I wanted to." When questioned as to what she would do differently, she stated that she would do something similar to what was done.

Teacher 1 expresses an evaluation that it is something that she sees as valuable but, as previously determined, it is not valid within her current frame of knowledge. This adds a second reason for her non-adoption: the absence of control and freedom of design. A desire for agency in the design phase is evident. From the teacher's perspective, her part in the design process was insufficient for her to feel the required level of freedom and control. This could reflect her absence from the design process in two ways: uninvolvement from the HOD's side or uninvolvement from her own. Her admission that she would do something similar had it been up to her could mean: 1. a mere sense of participation could have been sufficient to motivate her towards adoption, 2. a lack of involvement in the design process (by the HOD's or the teacher's own hand) left her disinvested, 3. no alternative option has been conceptualised, or 4. that she has a

genuine conceived idea similar to what the HOD's design but she felt hindered by her lack of knowledge and participation in the design process.

Curricular Freedom

She expressed that the document, even its bare form, was a rigid structure that she "had" to adhere to and that she "would have done it differently". She felt that even with the freedom to change it, it was not her idea.

Teacher 1 did not make any changes to the Google document, even though an expectation to do so was created. Within the concept of expectation, she experienced the perspective that she *had* to, she was placed on a burning platform and she resisted by rebelling and doing it any other way - even if, with sufficient freedom, she would have done it the same way. The autonomy that the HOD allowed her teachers as part of the curricular freedom allows the educator to reject the technology and the expectation. This yields the result that when using enforced adoption, one would have to enforce the application as well.

She experienced the freedom to teach a concept her way, and to have learners do an activity as she designed it. These experiences fell within the method but, as far as she was aware. they did not fall within her or her students' abilities with the designated technological tool.

Mediation and change

The educator believes that the past pedagogic discourse to which the learners have become accustomed - their past experienced pedagogic patterns - provides resistance to

change. She has experienced that learners are more engaged and "learn more" when they use a particular skill. She acknowledges to feeling that she is teaching when she activates learners towards acquiring and using/honing these skills and as they are "figuring things out as they do it on their own". She has discovered that everything does not need to be explained, and that learners can discover independently. She even acknowledges not teaching all of the available tools of the subject to them explicitly, "so when they use other tools and they discover, then I know that they are learning." She believes that learning as a process is important. She believes the method is a valid solution, but as a junior teacher she feels her experience and confidence are insufficient. She acknowledges that she struggles to maintain regulatory discourse while iPads are being used in the classroom, potentially explaining a resistance to the tool's adoption. She acknowledges her awareness of regulatory discourse allowing for instructional discourse by stating that "it seems necessary in order to teach something to learners". She provides an example of struggling to maintain discipline when activities are done by the river due to her voice not being audible above the sound of the water and the distraction of a ball. She feels that the technological tool has great potential in the fact that the predefined structure guides learners well and it allows for personalisation, even though she felt it was rigid. However, she also claims that the learners were too immature to make use of the iPad's affordances.

It seems that Teacher 1 is comfortable leaving some things to discovery, but considering her stated proclivity to teach certain aspects in detail it seems that they are limited to the things that the educator "trusts" can be learned independently and the concepts that she feels need to be taught in detail - her precious pedagogic patterns and prejudices.

Experience may lead her to believe that more knowledge can be acquired through discovery, even that which she feels she has to teach explicitly. The educator is honest in the fact that, considering the level of regulatory discourse she is able to maintain, she is more able to manage the use of mundane teaching tools due to her distrust of iPads and lack of ability to manage what learners access. She discovered that iPads' affordances of immediacy and communication within pedagogic discourse can also be constraints within regulatory discourse. Three possible reasons, or a combination of reasons, can be posited for her belief that the learners are too immature: 1. Her own design of implementation and/or regulatory discourse was insufficient to allow for effective instructional discourse using iPads, 2. The learners lack the internal regulative ability when faced with potential distractions, or 3. They lack the necessary knowledge to use the tool in the intended way.

Teacher Belief and Change

Teacher 2 shows a clear approval of the idea of innovation within her subject: "we definitely have space to innovate and it is definitely necessary." She values the content of her subject greatly, especially in a practical sense, which motivates her to find ways to convey it to learners using the methods and knowledge that she has mastered. She points out that a lack of learner motivation for the content is her biggest challenge. She thus reveals her motivation as lighting a burning ambition within learners to acquire the skills that she sees as valuable.

Motivation and opportunity alone will not ensure the use of technology; the active intentional acquisition of knowledge is required. If not, expectations of use will be met

with resistance in attitude, and be circumvented by the autonomy of curricular freedom. The method, to her, demonstrates the practicality that she associates with good teaching and learning practice; however, she clearly does not hold the tool in that regard yet.

Analysis: Teacher 2

The teacher describes her experience in education as “very very wide”. She owned a franchise of schools and has taught in every phase from foundation to tertiary- and adult education. She has experience in teaching Geography, Afrikaans, History, and Visual Art.

Affordances and Knowledge

Teacher 2 displays the desire to embrace the technologies and learn more. She states that she is “now more comfortable with knowing how to use the tech”. She expresses her admiration for the affordance of communication, based on how easy it makes mass communication, which is the affordance that she has mainly used.

Teacher 2 has acquired some acquaintance knowledge and “how-to” knowledge in terms of the new technology. This is because she has gained experience with it and has attempted to use it. This alludes to a potential clash between the framework and the HOD’s imagined time frame of implementation. The educator only started making changes to the framework after a second term working with it - too late to distribute to learners in its original format, but definitely effective as a reflective exercise in gaining expertise for the future. The other affordances have remained mainly veiled as she has spent little time exploring.

TPCK Progression

The educator acknowledges a lack of technological knowledge in the set-up of her tools, so she does use technology in her lessons “but not nearly as much as I want to." She acknowledges that she learns and gains skills when she plays with technology, and she needs “more of that time and a target to work to”.

Teachers need time to come to grips with new technologies, not only time to be trained but also time to take ownership of a tool and gain experience with it, ie. train themselves, in order of acquaintance, then know-how, then how-to. Because these knowledges are built on top of one another, a teacher will not know how-to if they do not have the know-how, and they will not be able to gain know-how if they do not have acquaintance knowledge.

Control and Freedom

Expected use

Teacher 2 communicates that she is using the digital tools, stating that educators must get into the world of learners (referring to the digital world) and connect that world with teaching in a balanced way. She acknowledges that something simple like Google Earth on a classroom projector is invaluable to a school - not only narratively but interactively, as she uses it hands-on in lessons.

Because Teacher 2 acknowledges a lack of knowledge, but states that she does use it, one must ask whether her use is superficial or experimental. Reflection is part of both

learner and teacher communicative framework resulting in a useful activity if it is experimental. It seems that she grasps the possibility of affordances that are beyond her technological abilities to access. This could be an indicator that the next level of knowledge is being acquired, or that it is not always a requirement for the awareness of affordances, but potentially very well for its use. This is significant because the teacher seems motivated to want to change due to her perception of these affordances. Thus, affordances that are deemed valuable to the educator can act as a contributing factor to motivate the acquisition and use of the knowledge to exploit those affordances.

Curricular freedom

The educator feels that there is room for innovation in the curriculum, especially in the junior grades, even though they are partly bound to it. She displays a willingness to follow the curricular path set out before her, but also to take up technological tools only as far as she is capable with them. If not, she reverts to previously trusted tools.

Mediation and change

The new method reminded Teacher 2 of thematic teaching, a method she has used before, and she accepts it as the natural way of learning. The educator acknowledges the importance of active learning through applying what you know. “My goal is for them to see some else’s viewpoint. When I see that there is a change in attitude, when I can see that, then teaching has happened.” She describes this as deep change, a change beyond facts that can be recalled and searched for. She believes that engaging learners requires feedback from realistic external factors. She sees her role as showing learners what thought patterns to follow and modelling that using technology for this, she states, “is

incredible", again referring more to its potential and less to her actual experience of it. She acknowledges that different generations teach and use technological tools in different ways and sees her way as simplifying things until they are understandable. The new tools also frustrated the teacher to some extent, but this frustration she feels helped her to relate to her learners. She sought more creativity in what the learners were meant to do and found the value in creating. She wanted to do this by showing them various skills and then using something to "pull it all together". In terms of regulatory discourse, the educator acknowledges that a platform from which to discover and research must be given. She provides an example of being able to "close" or conclude a lesson as designed, "is an important step," which she laments losing when lessons are cut short. In terms of a learning process, it is the process and not the tool that matters to her most as she comments that they can keep record and notes with any tool they wish.

This may provide Teacher 2 with a proclivity against using technology as a substitute for the "real world", leading her to be resistant to its use in that aspect. She explains that they practised applying the scientific method as part of the method, and learners were able to add creativity while navigating the method appropriately. It is easy to see that she would be resistant to the tool as she is not an expert with it, and simplifying something with the use of a tool in which a person does not have a lot of expertise would be difficult. The method she describes is similar to the method the HOD wanted to introduce, but through frustration in terms of technology and method, it is evident that her lack of experience with both made the process cumbersome to her. If her method is so similar to the introduced method, it again alludes to a lack of freedom of control and lack of knowledge of what is possible that stopped the educator from adopting the

technologies entirely, or potentially teaching suboptimally while trying to engage with un-acquired or partially-acquired technologies. She confirms that a regulatory discourse is necessary for her pedagogic discourse to occur. If learners are left to use technology as a means to her ends, it does rest on the assumption that learners have already acquired an internal regulatory discourse that allows for self-regulated and externally guided pedagogic actions. This is one that Teacher 1 alluded to as potentially obstructing to the new method in her experience.

Teacher Belief and Change

An interesting statement that Teacher 2 makes is that a child must first be made to feel secure, in order to trust an educator: "they won't trust any innovation you bring if they don't trust you" .In reference to building a relationship with learners in order to teach them, she asserts that "It is reaching children where they are at and we need technology to get to that". She emphatically states about Google Classroom, a technology that was peripheral to this study, that "it would be wonderful if we were all on it." Her predilection is to "rather feel like a Grade 1 with tech [meaning tool] than reject it," - she feels that would be rejecting the world of the learners. She has found that technology is an inconvenience when she "just wants to teach", perhaps illuminating it as a growing skill rather than a "go-to" tool. She expressed that getting to know technological tools is a burden, but there are ways in which she prefers learning. As the educator states of learners, educators may "feel inhibited [if] they don't feel secure; they then feel threatened or under pressure".

Only once a learner has established the educator as a reliable source will they be open to what they say. This adds a peculiar dimension because the validity of a teacher is assumed to be present through their authority. It seems that this teacher alludes to a willful decision on the part of the learner to participate using the offered method and tool, rather than an enforced one. Technology should be used, according to the educator, to reach children where they are, meaning that they can be reached in their socio-cultural digital realm. She uses the technologies' affordance of communication in her classroom as supportive in the discussion of viewpoints relevant to learners and the subject. Overall, the importance of learner involvement and perspectives is what she is trying to leverage technology towards. The educator shared good personal experiences with the method and certain parts of the tool. Her mention of feeling as insecure as a child may be reflective of her experience as an education: it may well result in poor personal experiences, no matter what vicarious experiences they may have.

Analysis: Teacher 3

It is the educator's 34th year in education. She expressed that "a lot has changed" but that she enjoys technology in education, especially when it introduces the visual into teaching. She states that she "would have loved the visual" and has experienced "it to be a hundred percent better than any other school I've been to". She initially started studying teaching and hated it, but as soon as she started getting involved in practicals she started to love it. She has mostly taught History and English, both of which provide a platform for engaging with learners, which she really enjoys. She believes that education should be about developing the child emotionally and not just academically.

Affordances and Knowledge

The educator professes that the accessibility affordance of Google Classroom is of great value to her, as is the narrative affordance of videos. She finds the visual nature of many digital tools exciting and useful as she feels it "resonates with [her] personality". She also expresses her fondness for the efficiency of technology.

The accessibility affordance has made it more convenient both for her and, in her experience, for the learners. She also finds visual experience more valid, but she freely states that this may be due to her personal preferences rather than pedagogic superiority. The educator clearly states her approval of technological tools as an aide, yet did not make any changes to the framework.

TPCK Progression

Teacher 3 acknowledges not using a lot of variety, ”because I don’t know a great deal, but I do use the variety I know”. When she is comfortable enough to use something, that is when she will use it. How she judges this comes down to her statement that “one needs to be brave”.

Teacher 3 is aware that more technology exists, but she is skittish and wants to be shown its aboutness and some affordances before trying it. Trying something new can rightly be daunting, but the educator displays the willingness to change her actions in order to test whether she wants to change her beliefs - the courage of which she spoke. She also presents an internal awareness of when her acquaintance knowledge and “how-to” knowledge are sufficient enough for her to start using it. This explains why she is using technologies in some substitutive manners. The reflective awareness makes her willingness to use different tools a known factor, albeit internal. By making it known to herself she is able to be a lot more self-regulatory and may even need less encouragement to progress with learning new technologies and integrating them into her TPCK through experimentation. However, the pace of her TK and TPK acquisition and the stimulation that acquisition was given may be the reasons she has not used the tool more that substitutivity.

Control and Freedom

Expressed use

Teacher 3 acknowledges being overwhelmed by the new technology. It took some time before she became confident in technological tools, but she does feel that she is starting to become digitally literate, and even though the educator did not make changes to the tool, she acknowledges that she "needs to make more headway" in exploring it and before she is willing to own it.

Because she felt overwhelmed, it is understandable that she is hesitant to use the framework. Once she has done this exploration she will be at a point where she can be "brave" enough to try the tool in conjunction with the methodology.

Curricular freedom

Curricular leeway is present, especially in the lower grades, according to the educator. The teacher feels the freedom to follow her own agenda: as long as it is "fun and Geographic, I think I am on the right road". In this, she believes she has the space to innovate in order to build learners and "make them grow". She allows diversions from learners in order to gain their perspective - from that of "vulnerable human beings". She is clearly interested in the psychological health and stability of learners as well as their academic progression. The educator believes that creating a safe yet accountable space where she and learners are free to pursue various sequences is where she feels her freedom is most valuable. She maintains overall progression and sequencing, but minor side-discussions are encouraged from learners and herself. She feels that both she and

the learners are more comfortable in a free approach - the new method. The educator perceives freedom outside of the technological tool, of which she does not possess sufficient knowledge to attempt to use.

Teacher 3's requirement that curricular freedom should remain relevant to the subject maintains solid boundaries of scientific discourse. It is evident that the educator trusts her own regulatory discourse to allow for instructional discourse. She feels that bringing in outside elements and making them part of the lessons, incorporating them into the syllabus, causes her to remain passionate and the subject relevant. Freedom for the learners to bring their own knowledge into the lessons may be reflective of the need for curricular freedom of an educator, who would want to bring their own knowledge to bear on the learners.

Mediation and change

For Teacher 3, teaching means to engage learners by responding to their comments and reactions. She believes that the tool allows for good instructional variation, as she states that too much of one single affordance is bad due to diminishing returns on interest. The educator has experienced that the practical nature of work "is the learning part - not just learning it in your head". "Once they realise you will take care of them, they will respond in kind," alludes to a learner's awareness of teacher benevolence. The new method, she believes, is much better: "You end up being next to them, helping them more, instead of being in front of the class". She states that the approach may not work for some teachers who are attached to grading and attaching marks to every task, but

that those things rob them of the opportunity to spend time with learners, guiding them narratively and building the relationships necessary for trust.

For Teacher 3, regulatory discourse is the presence of physical and psychological learner safety, discipline through emotional connection and building a trust relationship. This also suggests that learners will allow an educator greater credence if they trust them, e.g. if they trust the teacher, they will trust the tools, content and methods introduced. The way the teacher interacts with learners, building their trust, letting go of the specific outcome will eventually lead to loyalty and real power (Schuitema, 2011, p.28). She displays Schuitema's quality of leadership of the class instead of management - she perceptibly uses the syllabus to build her learners, rather than using learners to get curricular tasks done or to reach outcomes. She sees this as the way that she will be able to transfer her burning ambition for the subject to her learners. She sees this trust as the main tool she has in maintaining regulatory discourse and, in turn, it allows for easier and enhanced instructional discourse.

Teacher Belief and Change

"It did positively impact the way that I teach - I think that is what our HOD wants"; the educator believes that the process has enhanced her as a teacher and that continued progress towards the HOD's goals will continue to do the same. She believes that a reason for teachers not adopting new technologies is that they are scared of doing it incorrectly. This educator shared good personal experiences with the method and certain parts of the tools, stating that she "loves" Google Classroom. She also used videos as learner-centred instructional and creation tools, as "kids are terrified to stand up in front

of each other and they love using tech" to make videos. She recommends the technology they are using. She feels that digital tools lend themselves to Geography teaching and are the next best thing to being there in person. Access to current events is available freely and, because they often support the syllabus at various intervals, they are a great resource from which to draw.

Teacher 3 now elaborates on the reason for which she feels educators have to be brave, because they have a fear of doing something wrong. In my view, an educator has this fear because they feel the need to be the authority in the classroom, but being the authority on how to treat something that they will not know is invaluable. The bravery of approaching something that in not known is perhaps something that should be modelled to learners. She uses the technology at her disposal - the affordances of which she is aware, and confident in using. This suggests that affordances can be visible to teachers but unreachable due to lack of technical expertise. The educator has displayed a great tendency towards relationship-based interactions with learners. Yet she still acknowledges that she thinks the learners will benefit from technologies because they will connect with them on their level.

In the next chapter I will discuss the commonalities, issues, and insights gained from the analysis, and connect the discussions and insights gained from these interviews back to the field and their relevance within literature today.

CHAPTER 6: DISCUSSION

Access to the Use of Technology: Affordances, TPCK and Knowledge

The concept of affordances, how they become perceptible to teachers, and how they enter the conversational exchanges in the pedagogic process through technology, are used to describe how technology adds pedagogic value, the first research objective.

Affordances exist progressively from unperceived to implemented. The barrier between unperceived and perceived affordances is broken by *acquaintance knowledge*, which reveals affordances obvious and innate in the design of the technological object, and know-how knowledge which reveals affordances beyond the obvious through the acquisition of skills. Similarly, the barrier between perceived affordances and subsequent consideration and/or implementation in the design process is broken by *propositional knowledge*. Knowledge of technology as object or means therefore exists progressively alongside affordances, each integrating itself and revealing or enabling affordances. However, expertise enters the model once an inferential relationship exists between the different kinds of knowledge and the content of the application.

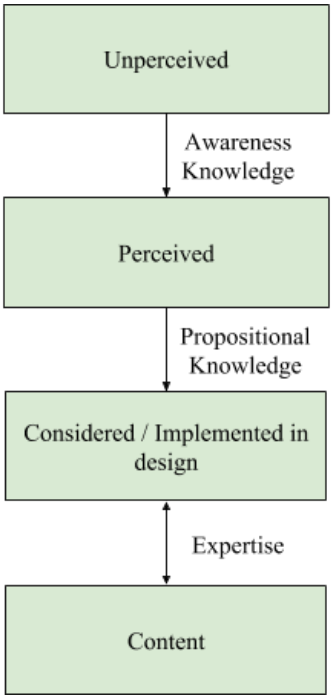


Fig 7.1 Affordance Adoption Progression

The concepts of how knowledge of a technological tool develops towards expertise, TPCK, and how technological integration develops, are used to discuss how teachers gain access to technology to leverage it pedagogically, the second research objective.

A teacher effectively has a level of TPCK when they teach with any variety of technological tools, contemporary or not. An educator seems inclined to maintain an environment in which they feel education is happening in a valid manner. Adoption should then rather be seen as change as it involves the transfer from one TPCK-structure to a new one. In a previous TPCK structure it is assumed that affordances are perceptible to educators, that educators have the ability to make use of them and that they do. Considering the movement from one TPCK structure to another in terms of affordances and knowledge, we can draw some parallels:

1. Technological Knowledge - acquaintance knowledge and know-how allow for the awareness and potential use of affordances. Technology is seen as an object.
2. Technological Pedagogic Knowledge - Know-how and propositional knowledge allows for the entry of affordances into teaching. Technology is now seen as a means.
3. Technological Pedagogic Content Knowledge - The inferential relationship between the knowledge and content now allows for expertise to form through use.

When speaking about technology adoption, it would be more accurate to specify that adoption is a process of knowledge acquisition to gain awareness and ability of affordances, to implement them pedagogically with content.

It is apparent that the educators in this case study did not have the necessary knowledge to exploit the affordances of the technological tools with which they attempted to work fully. Kinsey and Company in Van Thiel suggests that "individual teachers need to gain understanding of specific best practices. In general, this can only be achieved through the demonstration of such practices in an authentic setting" (2018, p. 4). Practically speaking, the training only demonstrated limited uses of Google Docs and Classroom. The educators were unable to use them beyond what was shown and mostly did not or were not even able to use them to that degree. With their adoption level still at an emerging level, it is evident that training of the sort described in Van Thiel is required to gain the necessary knowledge. Kinsey and Company in Van Thiel further explain that successful schools "create a culture in their schools in which collaborative planning,

reflection on instruction, and peer coaching are the norm and constant features of school life. This enables teachers to develop continuously". Even though collaborative planning was part of the initial design process of the method, it was not the case for the technological tool. The inability to exploit the affordances was a common statement among all educators. The HOD ensured that the educators were aware of what technology can do, but that level of propositional knowledge was beyond their know-how. All of them noted that they did acquire some know-how and propositional knowledge. This occurred mainly in terms of the affordances of communication and collaboration, and accessibility. This is potentially due to the innately communicative nature of ICTs and the innately communicate nature of teaching seeming to be such a natural fit. The educators were all able to provide examples of how they used these affordances in an increasingly complex manner, ie. not just substitutivity. It follows that when educators measure their use of technology against one of the adoption progression standards, it is valuable to interpret technology as their use of affordances.

It seems that the innate communicative nature of teaching and ICTs comes along with some exclusivity of medium. One teacher notes that using common communication tools, tools with which all participants are familiar and trusted, is necessary for a smoothly flowing class. The other educators professed that digital technology is the communication tool of choice for learners, but that pedagogical communication systems may be lagging behind in non-contemporary media. This blocks the affordances that modern technology allows.

The Professional Development Framework for Digital Learning (Department of Basic Education, 2018) sets out the support and development aspect of this strategy, as the "[k]ey to achieving the goals of this Framework are educator competencies of planning and facilitating digital learning." (p. 14). All developmental objectives of TPCK are present and integrated into the competency sub-categories of the Framework. Indeed, this Framework places the TPCK model explicitly at the centre of its thought base. It notes the "three professional development knowledge areas" (p. 20) progressively in order of importance from TK, CK and PK. It places each combination of TPCK at a different developmental stage in a typical teacher's training. To this end, it uses a change grid that places pedagogy on one axis and awareness and use of digital tools on a second axis. Development to the ideal balanced and advanced use of both is interpreted on the SAMR model (ibid Puentadura, p. 17).

The teachers' initial TPCK base seemed insufficient in comparison to the developmental state in which the technology and pedagogy was placed. The educators all seem to be at a substitutive level while this technology was aimed at a transformative level. The HOD attempted to enrich this through training - she did not allow the teachers to progress along the development cline, but attempted to jump them onto the desired level.

Even though the educators in this case study may not have used the technology to the extent initially envisioned by the HOD, they all acknowledged progress in their know-how and propositional knowledge. It seems that the initial espoused approach of the HOD had a collaborative design orientation in terms of pedagogy, but not in terms

of digital tools. The educators did not use the tools because they were in a position of acquiring new pedagogical and technological knowledge,

1. which led to cognitive overload and the shedding of some of that load, or
2. the necessity to apply was greater than the opportunity to gain sufficient knowledge.

Teaching must continue on a practical level: they abandoned the digital tool - the aspect about which they had least knowledge, and embraced the new pedagogy. I can postulate from this that where teachers have not developed the consolidated TPK or TPCK, the knowledge that is being introduced, of which teachers carry the least ability, will be abandoned. It may seem obvious, but it is important insofar as it may explain why one can encounter initial signs of adoption and then subsequent regression.

Different teachers are at different levels in terms of knowledge and TPCK. Time to become acquainted with the technologies seems to be a common requirement in order to progress from technology as object to means. When a teacher is not able to use it in the latter form, then it will be abandoned.

Control and Freedom

The concept of good personal and vicarious experiences, curricular freedom, and regulatory discourse illuminates the role that autonomy plays when a new technology is prescribed, the third research objective. In order to facilitate successful adoption, educators should at least experience the belief that they have sufficient freedom within

the curriculum. Even though the subject head attempted to use a design approach to incorporate the various teachers, she took much of that belief away.

Curricular freedom for a teacher is aligned with curricular control by that educator. The HOD required the use of a method and a tool in the educators' instructional methods. Many of them did not live up to the expectation. All the teachers fell back on familiar tools, even if that included traces of previously-used ICTs. They did maintain the new method of teaching, deviating at certain points as they saw fit. They all agreed that the new method and tool are conceptually solid, and they agreed that it is a positive development. So why not embrace the tools?

Once one is aware of affordances, one is able to incorporate them into the design process. If the design of the tool includes affordances that are unavailable to an educator then the tool may be rejected, as is the case with all three educators. The first educator espoused the lack of agency in the design process and the expectation of use itself as reasons she did not adopt it. She wants to use the method and the tool, but she wants to apply it in her particular way. A lack of knowledge, agency and experience is clearly having an adverse effect on her personal experience with the technology. Educators 2 and 3 agreed in that they were able to use the method, but that their technological abilities did not allow them to use the tool. They could perceive some of the affordances, but these were not within reach of their abilities. Both of them stated that the tools that were within their abilities were used, however. It seems that the HOD's attempt at reverse-engineering the skills of technology in teacher training through expected use resulted in a situation where teachers had to use a tool that they did not

know how to use. The expectation of learning how to use something by using it without the ability leads to minimal use. Teachers will only use a tool that they see as valid, and in this context they need to know how it works in order to determine its validity. Educators 2 and 3 felt that they had sufficient curricular freedom, apart from the tool, to pursue the method and their own ambitions. They then supplemented this in a limited manner using ICT tools with which they were proficient.

Regulatory discourse can both inhibit and allow instructional discourse. The educators all agree that some structure is needed for teaching to take place. Educator 1 found that iPads introduced a new layer of complexity in terms of regulatory discourse, an aspect with which she was still coming to grips as a new educator. Educator 2 and 3 felt free to allow learners to use technology to aid them, within the relationship-based regulatory framework that they established in their classrooms. These two teachers explicitly stated that a trusting relationship between learner and educator constitutes regulatory discourse and not only enables instructional discourse when using a new tool but also enhances it. The teachers agreed that the practical application of a skill is the best way to hone it. This is also the premise upon which the method is based. In order for them to see the use of a tool as valid, it should approximate, from their perspective, authentic use of a skill more than, or potentially at the same level as, the tool already being used to practise that skill. The educators all agreed that iPads are the next best thing when unable to go to the location itself, acknowledging its potential as a superior tool of access to information.

The educators all agreed that the new method is a closer approximation to real skills, which is a better manner of honing their skills and acquiring knowledge. They all agreed that iPads can provide the platform for better instruction. However, as regulatory discourse is a requirement for instructional discourse, it should be specifically noted that, as far as technological tools are a part of instructional discourse, regulatory discourse also manages those tools.

Teacher Belief and Change

The concept of motivated and enforced adoption, along with the requirement of appropriate training, and suggested teacher courage address how teachers would be willing to change tried and trusted methods and venture towards newer technologies. Currently, educators seem or feel unequipped in terms of the tools they are expected to use. This will lead to hesitancy even if they are motivated to use it. The educators suggest that the ability to use technology will enable the better building of relationships with learners because it is what the learners find to be a valid form of communication.

Beliefs can more easily be changed through experience in a state of motivation, supported by access to knowledge. If this cycle is disrupted, progression along the adoption cline will be halted. In a motivated adoption cycle, there is little to no resistance, due to the internal motivation of the participants (Fig 7.2).

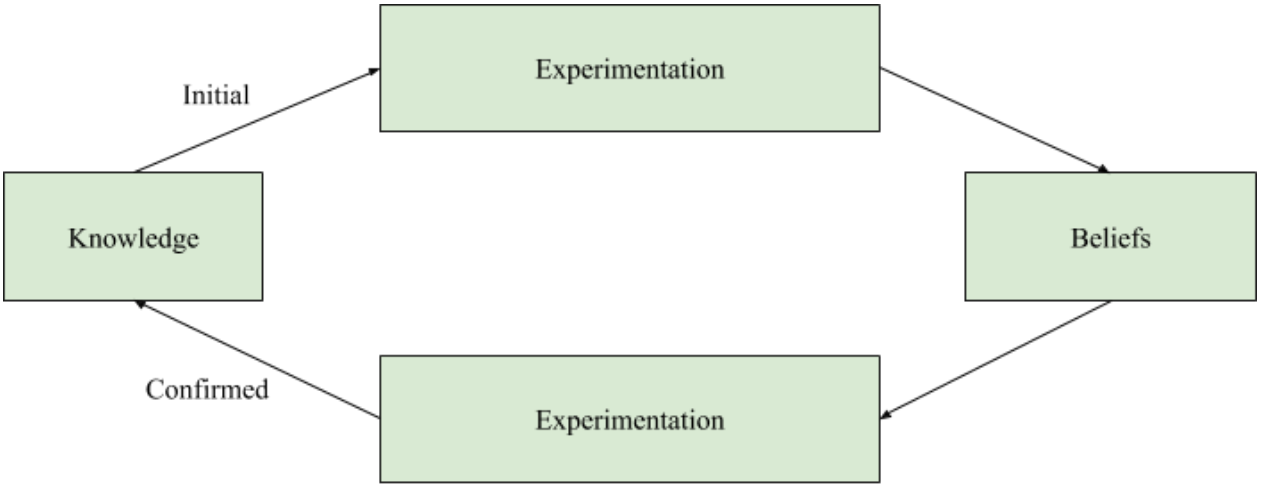


Fig 7.2 Motivated Adoption Cycle

Belief changes are resisted due to a state of enforcement, prior knowledge, existing beliefs or past experiences. Resistance manifests as actions of educators to disrupt the cycle of adoption. During experimentation, for example, educators may not pay attention, and may discard instructions and guidance. In their knowledge, for example, they could employ various biases or opinions as a defense just to contradict the suggested new knowledge, sometimes even if they do not believe the various employed biases or opinions themselves. It also seems that educators will resist to some extent throughout the whole cycle in a state of enforcement, but resist strongly in the specific areas that are an additional or overall cause of their resistance. It takes a lot more effort and time to create less sustaining and persistent change if resistance is not eliminated. Subsequently, there is an underlying goal behind Windschitl's three requirements in this process (questioning personal practices and the practices of others, making assumptions explicit, and using classrooms for experimentation) and that goal should be the elimination of resistances.

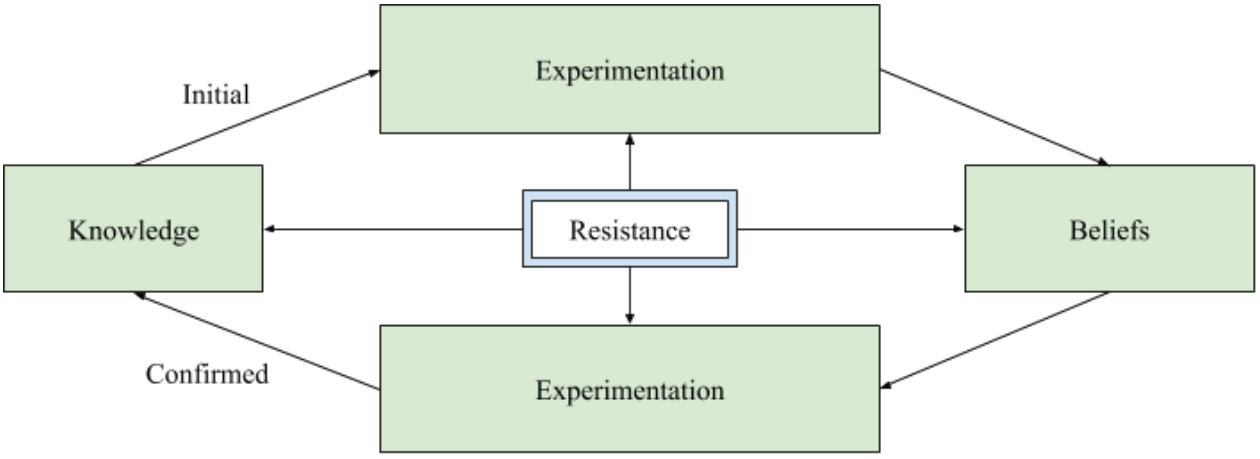


Fig 7.3 Enforced Adoption Cycle

All three educators acknowledge that they are inexperienced when it comes to the expected technological tool. Two educators stated that when learners do not feel secure they will not do something, in a sense reflecting the educators as teachers. Teacher 1 stated that she does not trust technology as much as paper, Teacher 2 stated that one can only introduce innovations into a classroom if there is trust, and Teacher 3 stated that those adopting the innovation should feel secure, as people are scared to make mistakes. However, how does one transfer with knowledge to the next developmental level of affordance awareness, affordance ability or expertise? One educator suggests an answer: to change, one must be brave. When every reason for adopting a new TPCK-structure exists, and when one has the knowledge to progress, all that remains is the courage to begin gaining new experiences and building expertise.

CHAPTER 7: CONCLUSIONS

Technology, specifically digital technology, is pervasive throughout society. Even though all schools are not equipped for the digital and information age, this is steadily changing. The world that students are graduating into is busy making, or has already made, that shift.

I investigated the impact that the introduction of iPads, Google Docs and a new teaching methodology had on three Geography teachers in a Johannesburg private school. The introduction of these technologies came neither without prior planning nor without reason. Some of the reasons were: relevance within the modern society, relevance within contemporary academic practice, and advancing teacher skills with digital tools. One definite outcome is that the time that planning and design require is great, and that the process is a long and an adaptive one. The technology was introduced to the teachers and they did make progress in their knowledge of it, which does mean progress in their adoption-readiness. I now discuss some conclusions from the discussion and analysis above.

Revisiting the research questions and objectives, it is established that affordances, that teachers are aware of, are the pedagogically valuable abilities that can enter their pedagogic practices as communicative tools. Teachers gain access to these affordances progressively from knowledge of the tool, *knowledge how* it works, knowledge of how to work it and lastly expertise. It is them integrated with a pedagogic process, which is measurable along various routes.

Technological Knowledge is comparable to knowledge by acquaintance and know-how. Technological Pedagogical Knowledge is comparable with *knowledge how* to use technology as a pedagogical means. Both of these require the addition of Content Knowledge in order to be applied to a specific subject. TPCK is therefore comparable to the expertise of teaching within educational technology - grasping and employing inferences in the application of ICTs as a means.

Access to technology is not only a physical consideration. Access to technology and the affordances they offer is a knowledge consideration. Teachers need to be equipped with the knowledge to take advantage of the affordances of the tools they are given. Even though PCK and TPACK can be acquired simultaneously through the design approach, it seems that the defined knowledge types (acquaintance, how to, and propositional) cannot be gained simultaneously, but rather successively. Presumably, one kind of knowledge builds on the other. Lack of knowledge leads to lack of affordance awareness, which in turn does not allow for experimentation or the potential progress towards gaining expertise. This is the key that allows new tools to compete with older tools by comparing the affordances they make available to the educator. If affordances are revealed as we gain knowledge and the different kinds of knowledge are built on one another (propositional knowledge requires "how-to" knowledge which in turn requires acquaintance knowledge), then it means that affordances of varying complexity will only be revealed if a certain level of knowledge is gained. Similarly, certain affordances need to be used in order to gain the next level of knowledge. The use of an affordance is therefore a method of building the kind of knowledge of the next tier. Potentially, even

affordances have this stacked quality independently, requiring the acquisition of a lower tier affordance (and knowledge) before acquiring a higher tier. This can be a point of further investigation as affordances could be classified and tiered parallel or within knowledge acquisition. It seems that the affordance of communication is the first affordance that does become revealed to those investigating ICTs and education. This could be due to the base nature of education being communicative or that the tool's design of implementation has communication at its heart, but in my opinion it would be both.

Users who are limited in their knowledge "how to" use a tool could feel compelled to use a tool that they do not know how to exploit for its affordances. Within this study, it became evident that this was one of the grounds for teachers to avoid adopting the technology. They rather chose to use a different tool with which they were familiar that had a similar affordance. Through teacher action the method and tool were diffused, to adopt that which they could do (the method) and escape that which they could not do (the tool) in exchange for a different tool that they could use (e.g. posters, pen and paper workbooks). When faced with expected use but also lacking the knowledge to achieve success in using two aspects of a new technology, it seems that the pedagogy will be diffused into method and tool and the one that is least known will be discarded.

Revisiting the research questions and objectives I conclude that autonomy is the allowance for personal instructional discourse and can be stifled by too much prescription, the effective regulatory discourse. Adequate training, support and good experiences have again been confirmed as determining factors of effective technology

integration and adoption. Pedagogic planning and decision making rely on exploiting specific affordances within assumed tools and their application within a specific design. Teachers will only experience curricular freedom if they are part of the various developmental stages. They may also experience freedom if there is allowance for variation within or of the affordances and tools to accomplish the same curricular goal. The feeling of security in knowledge helps to bridge the gap between good personal experience and potentially good vicarious experience. The concept of courage means that educators are willing to test whether they want to change their beliefs and reach a point where they are willing to have a good experience..

I was interested in each teacher's choices: their pedagogical reasoning and practices as they attempted to take up the technology. I have examined and discussed the relationship between their pedagogic beliefs and ICT use. I have examined and discussed the relationship between their pedagogic beliefs and ICT use, and their curricular freedom. I have examined and discussed the use of technology as object or means. I have also considered and discussed contextual contentions that arose while they did not adapt the framework but did adapt the technology and themselves to suit their pedagogy. This investigation of the research question led to descriptions and discussion, seen through the lenses of these considerations as the teachers followed a syllabus and method, but did not adopt the technological tools. The pedagogic considerations of teachers and their beliefs have been explored and discussed. It has also been considered and discussed how their pedagogy changed with the introduction of ICTs under the contextually specific conditions.

Based on the findings in this research report the following research issues arise:

1. If affordances are currently gleaned from individual technological tools, how would the affordances of multiple tools synergize?
2. Laurillard's conversational framework proposed a particular sequence and structure for affording communicative teaching exchanges. Would different sequences or omissions have significant impacts on affording communicative teaching exchanges?
3. Technological tools are becoming increasingly nested within the tool itself, e.g. *a* feature of an application on a digital device could be seen as a tool. Conceptually investigating technological tool hierarchies may reveal interesting nested affordances, or knowledge requirements to gain access to their pedagogical value.
4. There is tension between regulation and autonomy in educational management. Investigating the impact of an addition to an educational environment could be worthwhile.
5. The definition and further conceptualisation of positive educational experiences with technological tools may be useful in designing technological tool experiences intended to provide educators with a positive experience to facilitation adoption.

APPENDICES

Appendix 1 – Protocol: HOD Interview

This interview will be recorded via audio and will consist of the following questions:

1. Give me some background of your experience as teacher and subject head.

   [Ascertain biographical information in a series of questions]

2. How and why did you decide to become a Geography teacher?
3. In your view, what are the possibilities and challenges of teaching and learning Geography?

   [Elicit beliefs and pedagogical decisions in Geography education.]

4. How do you know that a teacher is teaching?

   [elicit internal belief about teaching / what counts as pedagogic discourse]

5. Do you think it is important to stick closely to the curriculum or is there leeway for innovation?

   [Elicit curricular freedom.]

6. There have been significant developments in the field of educational technology in recent years.
   1. Do you use any in your teaching?
   2. Have you used or heard about others that could contribute to teaching and learning concepts and procedures to be learned in geography? If so, which, and how?
7. You have recently introduced a new approach to working with iPads in the Geography classes.

   [Elicit previous and current educational technology use]

1. What is the approach and why did you decide to introduce it?

   [Probe what motivated the introduction of the specific method: semi-structured, minimum expected use, design approach]

2. Please describe how you prepared this new approach itself.
3. What did you do to prepare your teachers for it?
4. How do you think it is going so far?

Appendix 2 – Protocol: Teacher Interview

This interview will be recorded via audio and will consist of the following questions:

1. Give me some background of your experience as teacher and subject head.

   [Ascertain biographical information in a series of questions]
2. How and why did you decide to become a Geography teacher?
3. In your view, what are the possibilities and challenges of teaching and learning Geography?

   [Elicit beliefs and pedagogical decisions in Geography education.]
4. How do you know that a teacher is teaching?

   [elicit internal belief about teaching / what counts as pedagogic discourse]
5. Do you think it is important to stick closely to the curriculum or is there leeway for innovation?

   [Elicit curricular freedom.]
6. There have been significant developments in the field of educational technology in recent years.
    1. Do you use any in your teaching?
    2. Have you used or heard about others that could contribute to teaching and learning concepts and procedures to be learned in Geography? If so, how?
7. The HOD recently introduced a new approach to the Geography team. How have you experienced the new approach?

1. Has it brought about any changes to the ways you teach Geography?
2. Have you made any changes to the framework?
3. Would you recommend this kind of semi-structured to other teachers?

Appendix 3 – HOD Interview (Transcription)

Let's begin, firstly, please give me some background of your experience as a teacher and as a subject head, just a brief overview.

I started teaching in 1985, this is my fifth school. The subject head thing is quite interesting because you can diversify the subject, as you can experiment. I have done that over the course of the last 30 years. It is hard because the personalities of the people are all A-type personalities and you need to be careful not to stifle creativity or freedom. It's about the structure and if you understand where you're heading then that is your purpose as a teacher. I see my job as more as placing structure and seeing how teachers run with it letting them apply who they are and how they like to figure out and teach and not telling them that they will teach a certain way all they will do this and assess this way or that way. I do not like running a dictatorship for lack of a better word. I've always in my meetings had a thing of the week like who has come up with a creative thing of the week. Then we can all take the activity and apply it in our classes in our own ways and that's a small way where one teacher can help everybody. It can become their idea. There's an example where one teacher did something about rivers and it became applicable to a different teacher in a whole different section of the work.

Ok well have you always been involved in geography?

Yes I have been involved in other stuff like LO and PE but it has mainly in geography.

So how and why did you decide to become a geography teacher?

Basically with my kids it fitted into my husband's lifestyle as I trained to be a lawyer it becomes complicated when you want to have a family. It was very easy to then start teaching. It worked for family life and that was the driving force and then you get stuck in it and it very quickly becomes part of who you are. I've done philosophy and religious study in most of the schools but it's not the biggest subjects.

So in your view what are the possibilities and challenges of teaching and learning geography?

The possibilities are huge because it's a living subject. We could have done the cold front in Cape Town today. It's very dynamic to what's happening outside and it's relevant to people's lives and there's a whole lot of this stuff that's relevant. It just becomes more relevant with a computer and laptop and iPad at whatever and it becomes easier to show them the differences and it's evolved over the years to become better. It's a lot more interactive now I used Facebook the other day to show my kids at video clip one day and you can literally show them while you wait and while you are busy with something else. It can be something entirely different from what you were going to do and was actually planning to do the previous day. It can happen literally as you're teaching and you can keep organising it that way. The difficulties of the subject is it's quite difficult to get the spatial concept right because not a lot of children live in that spatial realm and understand the atmosphere that way. There's quite a lot of scientific special stuff that takes a while for kids to comprehend and not all of the matrics even totally comprehend and the science part of the curriculum is difficult to get across because you don't always have the the cross spectrum of abilities in the subject. So you have the weak, some of the middle and then I was some of the clever kids. That's very challenging because you do need to

get around to the kids who are struggling as well. That is one of the challenges of having a new class - finding out who are there who are the weaker kids.

And how much would you say does your way of teaching differ between these groups of identified learners?

Oh a lot. I might explain and show the bottom one way and showing a video and do the exercise and when they ask me questions I would sometimes go past and look at what they did. I would teach it to them and some learners do not learn with a lot of guidance and I need to spend a lot of time with the weaker ones alone. They usually sit in the front so that I can literally get to them and ask them why they did something and what were their thought processes. The years of teaching weak learners have taught me that and I have to sit with them and work with them. A learner will answer a question and I need to let him know that he hasn't told me everything and as if he can tell me anything else. I need to push him to tell me more. So then I ask them why they wrote something as they are writing very mundane stuff. They need to think about things them, what they're writing and by the time they get into exams they need to ask those questions to themselves I think that's difficult. I think that larger classes are difficult. It's difficult because you want to continue but you also don't want to lose the rest of the class.

So how do you know that teaching is happening how do you know that a teacher is teaching? What does it mean to teach to you?

For me it's to inspire to learn. For me they must investigate some of the things I explain and some of the things they need to investigate. I might introduce volcanoes and use a video but they don't really know what they are looking at so then we start talking about breaking it down into parts so we give them exercises and a little bit of an explanation to give them an enquiring mind and stimulation. I'm not really a chalk and talk person, I do it too but I do do a bit of that I do more case studies.

So imagine a floating eye around from class to class and you can see everything that it sees. What would count as teaching and what wouldn't?

It's a difficult question because it depends on the subject and it depends on what you're delivering I don't think there's a set model. There isn't a set of criteria to say that these criteria are met and then you taught. I don't think that's the way you succeed. In your classroom, do you inspire, do you allow for investigation, do you allow for collaboration, do you allow for participation, do you allow for all of those types of things? For me, that would make a teacher that would have taught and it is absolutely different for everyone I don't think there is a set list. I think it is unique to your personality and I think it is unique to the subject you teach and even to each class and situation you find yourself in.

Do you think it is important to stick to the curriculum or is there leeway for innovation?

I think matric is difficult because you have such a short space of time to prepare them for the exams so you tend to default to the exams which is quite frustrating because there are some nice things that happens to that grade but you don't have enough time to pursue those investigations. The other grades are stunning and I love it. You can give them a piece of work where you can divide them into groups and tell them that they are going to teach different sections at a certain point during the term and they can do whatever they need to do to achieve that. I absolutely feel there's freedom in the curriculum apart from matric and there's freedom in the way that the curriculum can be brought across. I take the plan that we discussed in our subject meetings and I

ask how can we get it across in another way. How can we teach these skills because they do not have to be taught in the same sequence, one after the other, and we can teach it in another way and by the end of a couple of countries we can tick off all the lists of things that they should be be able to do and we definitely try in the other grades to make it exciting.

There have been significant developments in the field of educational technology do you use technology in your lessons?

Yes I do always. I use presentations in geography always. I never ever teach without a PowerPoint. It is just less interesting. With that, one then sometimes comes up with different ways to investigate further with case studies for you for example. I use them all the time.

Have you heard of other technologies like concepts or procedures or methods to help teach geography?

Yes, obviously the field has developed quite a lot in the last couple of years so we've taken it on board. So, we've been playing around for a while and for the better. Geography committees have accepted that fieldwork is great so that has been accepted and obviously trying different applications and weather channels and other things that people have made available, even lectures, have made things more exciting and you're able to show things that you can't explain and now learners correctly see things happening so we can model and we can expose them to feel work and we can introduce those things to the lesson.

So at the beginning of the year you introduced a new way of teaching geography with iPads specifically in your classroom how did it work before?

Before, it was just textbooks and notes and we feel that because kids are so technologically advanced and because they obviously have a lot of technological knowledge regarding an iPad, more than some of us teachers, to continue to teach with paper is becoming archaic so it is a case of how can we take these concepts and put it into the life of technologies so that it is there so that we can get rid of a textbook.

So tell me, this new approach, what is it and why did you decide to introduce it?

So we decided to base it on a place that is familiar to learners and even fly to the countries that some learners would have even experienced themselves and put these learners into a live experience because they've got the iPads and they can visit these countries in more of an interactive way. So we were trying to create a structure out of South Africa where that is our home base and saying that these are the concepts, let's introduce them on the iPad with something that they know and something that they can see and something that they are involved in and then we can fly somewhere else and apply these skills somewhere else. So it was trying to take these very mundane skills and making them more alive and readily available on the technology or whatever and just to see how it would work. Would it make a difference, would it be more exciting? So it was sort of a challenge to see how we can do things differently to use the same content but differently.

So in this new technique what was the expectation of teachers?

I wanted to create the structure with the idea and hope that they would run with it in other words and make it better or build on it so that it became more exciting and more and more innovative and more and more interactional from the kids' point of view because mine was the sort of starting point but it wasn't meant to be there at the end. In fact if I looked back a year later in

December I didn't want to see my project, I wanted to see something that was changed, manipulated. I would be very disappointed if I saw my structure. I would be very disappointed.

Is there is there a minimum level of use that you're expecting from these teacher?

I'm hoping that they would have taken the idea and actually changed it and actually adapted to their different classes the different size of classes and that kind of thing, to take the actual product and put it on Google Classroom and get the kids to add things to it. I'd be disappointed if every booklet from every child looks the same. I think there was an opportunity to allow children to insert things into their booklets, to research within that booklet and to adopt things.

So describe to me how you prepared this new approach?

Six months before we started with the iPads we were here and we needed to use them and we know that iPads were going to become more available in our school so now it's a case of the learners have iPads and we've learnt and now we need to use it. If we don't use it, it never becomes part of your teaching. It says it will just remain some thing so we wanted to start and in grade 8 design something, start something, where maybe the rest of the school will follow or we will create banks from which the rest of the school would be able to draw. Where we can use this and we can adapt it to English or science or whatever. So we started to talk about how we can make it exciting. So that is what we wrote down, that was our blueprint. Our plan as a department - this took a couple of meetings and we can look at it

she shows the grade 8 syllabus on a date on a large mind map

This would lend itself to, for instance, starting in Johannesburg and then traveling to different locations like Kenya and asking: how is the transport different how is the climate different how is the time zones different? I then took this and I designed it into a document which we could distribute through Google Classroom, hoping that the teacher would then say: “Each of you then find a picture of an ocean current and put it in, for example, and then take transport stuff off the internet and it would become individual live documents for learners. But I don't think that it has happened and that is depressing for me.

So, I came up with the basic structure and thought and I put up a few YouTube videos. I wanted to show teachers where to begin and it'll be a starting point so that would lend itself to starting the discussion. I didn't want to give them everything and say: “now you need to teach like this.” That was not the idea. I wanted to give them a framework and now they can get the kids to interact with it to learn from it to change it, to build it and learn from each other and that sort of stuff.

What did you do to prepare your teachers?

We did quite a lot of discussions about where we shall start and how we shall start. So we started with a general structure and I asked where and everybody agreed and then I started showing them Google Classroom but by that time they've already seen it two or three times. They've seen me working with it and the structure a little bit, showing other learners how to work with it so we spoke a couple of times about it, had a few meetings about it and then I gave them the framework and then I told them to run with it. Be more creative, more involving for the kids and they have the dynamic and the ability to add to it as well. I don't want to see my booklet, it's not mine to keep at the end. It is just a framework from which we start.

How do you think it's going?

I'm not happy, maybe my expectations were set too high, thinking that it would become more picked up. I'm going to have to do a little bit of debriefing during the exams to sort out the problems of different problems scenarios but I know one teacher - I put everything on for her because they've changed nothing - so there are no changes to the booklets. It doesn't look like there are any interactive things for the learners, she may have added a few notes, but I envision that kids put into their books things that they found and what they looked at and I was aiming for something much more interactive.

Another teacher is possibly a little bit more clued up and and yet again another teacher I can't expect to be as clued up because she's busy with too many other subjects, but the booklet being distributed at the moment... I think it's my booklet.

A follow-up thought. Do you think it's changed the way that they teach?

No. One teacher's still doing posters. It's hard to ask teachers to change after 35 years. They are probably set in their ways. And she and the way she teaches are not ready to stand with iPads and say we are now in Nairobi.

And what about a relatively new teacher?

I think it has given her an opportunity to think that things don't always have to be the same. I don't think her classroom management is well structured yet so she is busy getting structure together and by giving her this freedom to not be restricted to paper but you can get the kids to research... she is much more responsive and coming up with tasks that fall within my criteria, this gives me hope. Teachers are still creative yet they are still using the old style. It doesn't involve using the technology. If I rate it out at 10 we are at 4 or 5, I expected more. I did not expect it to be 100% perfect. I wanted to say: "So we're 50% better with 20% more interactivity, so how did we become more interactive?" Now I just don't think there are any interactive things. The kids do have the notes on google classroom but then notes are on it but I don't think they are very interactive.

Do you think they are treating it as a very good summary? Do you think the medium is good for interactivity?

I think it is more about getting your head around how to teach differently. Perhaps it is something to do with how I set the book up thinking about how to do something differently. I looked at my matric syllabus and thought about how I would like it to do a different. I've introduced it to my staff and I actually want to drive it myself.

How would you feel if there was a very small change in the document but it had a big impact in the way they teach?

It is a difficult question. I was hoping we would get to a point where we are paperless because the Geography textbook is neither here nor there because everything is on Google. You have all of these black headings and you can pretty much just Google the content. You don't need it in a textbook. There is so much that can be done in the few years prior to matric on the actual iPads. I want to get to the point where I can tell the principle we do not need eBooks or textbooks we now have a document that has a really sound structure and the kids by the end of the year have created the best and most creative and individual set of notes that covers their syllabus so I've got and set the exam and I hope the climate graphs and comments will now be interactive

enough so the kids can cope in a completely strange country and they will be able to answer the questions I set them.

Appendix 4 – Teacher 1 Interview (Transcription)

Give me some background of your experience as a teacher.
I'm a new teacher. It has been about a year and a half since I've started teaching. I've always tutored at University, from second year onwards, so I've always taught. There is the experience that I have. Basically I enjoy teaching and I enjoy explaining what I've learnt and it makes me feel like I always want to share when I figure something out. The first thing I want to do is share what I figured out. It is just sometimes difficult because the passion isn't always in the children, so whatever I'm excited about, they aren't. It doesn't mean anything to the kids, so in the year and a half I've realised it is difficult to reach a child.

How and why did you decide to become a Geography teacher?

So I started studying geology with the full intention to become an exploratory geologist and explore the world and then I flunked my first year calculus and chemistry at university. In that same year at the end of the year I decided to just study pure geography with the intention to see if I can become a teacher. On a half bursary from BHP Billiton they put me at the geology department as well as the environmental rehabilitation department and to me it was a valuable learning experience and I realised that I won't be able to do anything with my Environmental degree. I'll have to use my geography degree and I finished that and I redid calculus and chemistry and I was still able to finish my geography degree in 3 years. Then I did my honours degree in environmental studies and because of that I didn't have access to my bursary anymore because they gave that to me as geologist not as environmentalist and from there I started to become an academic. I needed to start with my masters degree and it's taking very long and the whole time during this process I have tutored and it's something that I wouldn't do every year because it causes a lot of stress and then every year I decided again that I wanted to and I came back. My sister did her PGCE and started teaching and after my second year of masters she started asking me where I was going to get my income from because tutoring would not be sufficient and I felt like I had to start working and she told me to apply to start teaching as a temporary thing and naturally you can't just get into a school and start working. Actually even though there is a shortage there aren’t positions for education without qualifications and I didn't get a job as an educator so I thought I should rather do my PGCE and see if I can finish my degree while teaching and potentially later get my doctorate degree and become a lecturer later on. Which is possible with my degree but this isn't my goal anymore. I began my PGCE and it feels like I came home. After my temporary time working with kids it feels more fun to be a teacher. You can work with them on different platforms, not just on an academic platform at university you give information and then you are done and you would post the slides and if they want consultations they can discuss academics with you but further than that it is very impersonal; and yes, I love the information and the study field, the research field, and it opens the world for me but I also like to connect and work with kids on a personal level and on the sporting field to work with them and I gain access to being more active and to get to know them better. Yes somewhere where both of us are more relaxed and that is a lot more of a balanced lifestyle than would have been being a lecturer.

In your view, what are the possibilities and challenges of teaching and learning Geography?

Possibilities, definitely to change the way that a child thinks. You basically have the platform as geography as a subject. It has so many different facets. There are different ways that you can change a child's way of thinking, just through Geography the challenges are that kids don't want

to. They are just here because they reckon school's just here to pass and the real-life wait for them once they're done. So, it's actually as if it doesn't matter to them and this is because I think the old regime kind of taught us that you have to study, finish school and then you can go to real life. Even I experienced it this way, school is only a step to access the rest of your life, so, whatever you do at school is just for now. The school and the marks, actually, just the marks, that is what takes you further, not the content, not the skills. So basically everything is about marks and I think that is wrong. It's not all about marks and I started doing it this year. I gave them a task and when they asked how much it counts I replied that I don't even know whether it will count yet. I tried motivating them just to do it because it is an important learning experience. All I wanted them to do was to learn something through the process it's not necessary to quantify it, and then my mind is where the problem exists, and we have a problem because we can't really say they acquire those skills without we as teachers having attached a mark to it and then kids don't want to do anything unless they know that there is going to be a mark attached to it.

The possibilities in teaching it is using the different methods as geography is a very practical subject. I mean most of these things are applicable in the real world. It's a study of the real world. We can literally in our school, where we are now.. It's geographical location. This close to a river already is very geographical. We have got diepsloot, a social science geography location, you've got Fourways which is a whole different facet of geography. We've got the land, we got the climate within the specific area and we can see the difference between Winter and Summer. What happens to the river, the temperature and what impact it has on the river, except of course the fact that it is a structure. Structural elements in geography is also something that is influenced by climate... then every little aspect. We can incorporate every part of geography into it and we've got all these aspects around us in our school. So we can go out and we can study the world and the logistics are obviously some of the challenges we can't just go off. It is really unsafe, we can't just walk everywhere because there's a busy road and we need to get a bus and we need a driver and there's logistics and money involved in that. I know we are a private school and it's supposed to be accessible to us but it isn't always. You are going down to the river and physically explain the river... my actual voice isn't loud enough, so standing outside I actually physically shout and I think teaching teaches some people to use their voices outside but I struggle and the moment that our children walk outside their discipline goes, because the structure is gone. I know that discipline for me, as a younger teacher, I don't really find it that necessary in class, but it seems necessary in order to teach something to learners. They, for example, would somewhere find a soccer ball and just start playing soccer and you would have to call their attention back the whole time. They just want to play the whole time so learner attitude reflects their desire to just play. The first thing they ask me when they get into my classroom is if they can get a free lesson and it's sad to me but that's literally what we also did.

How do you know that a teacher is teaching?

Sometimes you can realise based on the way that they ask questions. I think that the kids ask questions... sometimes they are really good questions that learners use and sometimes there's actually no response. Now I'm wondering what else I could do to cause a different response in them so I've tried videos, but they are just as boring. It's really just someone else talking to them and you can try and make them interact with the content but if they are not interested then it doesn't matter how interactive you try to make to them, in my experience, it won't make a difference how they handle the experience. It feels to me that they've already made a decision about how they're going to handle it. I feel lots of times as if I'm actually giving them a project

and I get the kids to go out and do something, doing research, doing something a lot more practical. For me they learnt more because they actually got a skill and I'd like to say one day that even though they didn't go and study geography but they have a skill. Recognising order and research questions is this and this is my idea behind it. They had to discover whether the school is sustainable in terms of pupils, teachers in relation to kids, are teachers here to stay, is the way that they replace teachers sustainable and those kinds of concepts and they had to determine in some way whether the teachers are willing to stay without asking them about salary and in some way they had to find out if we as teachers, if we as cleaners, if we as people who work on the estate would stay at the school based on the way that the school is run. So I feel I'm teaching when I'm able to activate kids and that they are figuring things out as they do it on their own. I didn't explain too many tools to them, so when they use other tools and they discover then I know that they are learning. They don't necessarily know exactly how to do it, it is only a grade 9 level. Some of them made lots of mistakes so I don't know if they understood the information that they got in the end, but on the level that they had I felt that they acquired a skill and I want to be able to do that. I don't want them to feel like they have to study for geography but that they are actually getting skills.

Do you think it is important to stick closely to the curriculum or is there leeway for innovation?

Geography and the school with my HOD we definitely have space to innovate and it is definitely necessary. I feel that we can use the curriculum to teach kids in innovating ways. In the end what does it matter to know the difference between the two kinds of mountains, personally what does it matter? It doesn't make any impression on most people or on 99% of the kids, but if you want to go walking as a normal person you wanna go climb up a specific mountain and you want to know whether it's going to be very steep. He would want to know if you would need to take ropes with and then if you are able to identify the terrain around you based on a map it will make an impact in you knowing what you prepare for and how to prepare and how this hike would be so then it would touch more of them from 1% to 30% so if then ever then ask if you're able to build on this and they come and say "yes you can" or "no you can't" for various reasons for various reasons then they can use it. Most of the information that we teach should be taught in a way that they can actually use it and that is more the goal of geography.

There have been significant developments in the field of educational technology in recent years.

Do you use any in your teaching?

I use a computer, I use a data projector and sometimes I use powerpoints. I absolutely think that iPads are a distraction because they don't listen to me and they play games and there is no way for me to control it. They say if you are at the back of a classroom you can see it but it doesn't matter. What I've realised the easiest way to incorporate technology into a classroom is to give them access to what you have used on Google Classroom or to give them extra resources to access without them having to research it because they can just find it easily on Google and putting it on Google Classroom. Then they can, in their own time, go and look at it. I actually prefer just working with old fashioned books and pens like in the old times because most geography skills are required to be used on a fixed scale and on iPads everything zooms in and then everything becomes wrong because the scale changes so the scale needs to enlarge as they zoom, so lots of content is hard using iPads.

Have you used or heard about others that could contribute to teaching and learning concepts and procedures to be learned in geography? If so, which, and how?

Yes especially in my University years we really used lots of technology we depend on. GIS is one of the big themes in geography. It is geographical information systems, it is basically to layer different maps on top and then interpreting the data from it. It is literally the core of geography. It doesn't matter if you're looking at social problems, economic problems or political problems or physical geography problems, most of the time when you go out into the world in a job like a city planner then you need to use a GIS systems. Let's say you have your physical area and you need to see whether it is a valuable addition to the environment to build a mall. We'll need to see where settlements are. What are the classes of those settlements and what kind of mall would be suitable? So you need these programmes to set different buffer zones and layers and base your statistics theron. You do all kinds of enquiries without physically being in the environment and it is going to start it because everything is on satellite images.

Do you feel that if we have access to GIS at our school would it contribute?

GIS is part of the curriculum but we do it with pen and paper. We do have Google Earth which is open- or freeware so you can download it. We can use it but we do not have the tools they use at university because that specific program was unbelievable and we have to buy that licence and that is very expensive and the amount of time that we spend a year on GIS in the curriculum is too little. That actually begs the question if it's worth it. What I would do if I could change the curriculum to change all questions and topics to be based on real life so we would have a specific problem every year to research and these problems must have all aspects of geography. What's stopping me from doing this at the moment is the fact that I am a junior teacher so I don't feel that I can't apply that yet and within the ieb system we have to teach these kids to complete an IEB exam at the end of their matric year even if we can teach them to rather solve the problem and looking at the different themes. It is still important that they must know that certain questions are structured a specific way in exams and we spend time on that.

The HOD recently introduced a new approach to the geography team. How have you experienced the new approach?

I like the idea. It's a brilliant idea. It is basically the same train of thought that I have had, to see it if we can't make geography more holistic. To have a problem and apply the different themes to the same problem and then have different problems. It will make it matter to the kids, unfortunately we are working with grade eights. The way that they've been taught so far is that we have to progress from page 1 to page 10 and we have to study every comma and full stop because that is how we've been taught to learn. My greatest dream is that if they were to write a geography exam they will not have to study. They will not have to memorize anything but all of it will be inherent knowledge and applicable - it is something that they recognise exists in their real life and they don't actually have to study for it.

Do you think you've made a correct step in the right direction?

Absolutely, we have created a little bit of friction, especially with the first cycle test because the kids felt they weren't equipped because they didn't have any content to study from. The problem is they mustn't rely on book information. They are supposed to, in the class, be so interactive with the content they know it because you can see it and they've internalized it.

Within the Google Doc using iPads within the structure there is very little information and there's lots of space for kids to type in as they are loading and structuring information as they've interpreted it. Unluckily they are 13 years old, they don't know how to make a note and how to listen at the same time - they do not have that skill. It's something that we at Universities still struggle with, the problem is now they have these iPads and they are allowed to have it while the lesson is going on, so what are they doing? They play a game. So already they are not listening, they switched off.

I had problems at the beginning where they can't work online without changing my document so they each other download their own individual ones so I tried it but I couldn't control it so for me it was easier for them just to do the exercises in the book because I could take it in and mark it.

Has it brought about any changes to the ways you teach geography?

I did try, but one falls back into old ways quite easily. So the goal was in the first 13 weeks of the year to handle all concepts of geography or at least touch on it and explain it applicable to South Africa and in turn to do everything in a different place and have them use these skills to see certain things because we studied it for South Africa and discussed it in a different place. In order to research a different area having them apply the previous concepts, but I got stuck discussing length and breadth, longitude and latitude. I struggle explaining this concept to the grade eights. So I stood still explaining this concept to them. In the end we discussed this and climate. So we got stuck on different themes so it hasn't developed into the holistic image yet.

At this moment I recognise it is something that I want to do but I couldn't do it the way I wanted to. So, yes, but I want to do it. I want them to be able to see the things that I see and it's in the back of my mind the whole time.

Have you made any changes to the framework?

Not really. My biggest problem anyway was that she pretty much set up this document. With everything that you add you lose the impact of the document. My biggest concern is that she did something now and it was her personality and her way. She would have done it and yes she gave us the freedom to change it the way we wanted to but still... it was her idea. If I had to do something from scratch it would have been easier for me to make it mine, to do it in my way. So I don't know if it wouldn't have been a better idea for each teacher to create their own base documents. The document is literally a framework and it's not like I don't feel freedom to work with it. My freedom comes in it that I have a choice to use a specific activity or not and have them do it or not and I have the freedom to teach something the way I wanted to. So for example, teaching different zones of cities I ask them to design their own city and put appropriate zones where they should be. So the way I wanted to do it would fit in her framework but he wanted us to do it on the Google Doc itself and that is not the way that I would have preferred them doing it. I can see how they would be able to do it there and I would have even been able to mark it. It would definitely have been easier. What stopped me from doing this? I trust paper and I know that it is there because I can see it and it was physically done - independent of what a computer says. So it’s to fall back on what you trust. It's easy to hand out paper and tell them that is what I want. On a computer I have to explain to them different ways of doing it. Which includes frustrating problems that you can't always anticipate.

Would you recommend this kind of semi-structured to other teachers?

Well the thing is you want it to be there, in a school, and keep it these, so I don't necessarily want to share it with someone. It is definitely the way that we need to start thinking. The world of a learner has not been information driven especially not in terms of learning, he could know everything and then the use of that knowledge is more important. So what practical things can you do based on the information that you have? You don't memorized things because it is available to you. This framework, this platform rather, teaches them why something is the way it is so that when they get to the point in life when they have to make a critical decision or design something they will then realise which aspects to look at. You have to know what what to look at. You have to know what to do because of something. So from a grade a level they need to know that the south side of a mountain is the cold side so when you want to build something you have to build it on the north side with the house with most of its windows facing north. Even the learners realise where north and south are as they're in my class and they prefer sitting in certain parts during certain times of the day and certain times of the year. If they then realise where north is, that very much represents the idea behind or on top of which this platform is designed.

Appendix 5 – Teacher 2 Interview (Transcription)

Give me some background of your experience as a teacher.

Very very wide. I owned a small franchise of little schools for a couple of months and the others that I have taught were 38 years. I taught at all different levels, I suppose, so that's before pre prep even and then pre-prep and prep school high school and university. So I really taught the whole gambit. I taught Geography, Afrikaans, History, Art, ... so I have to quite a few subjects and I've taught many years and I've loved every minute.

How and why did you decide to become a Geography teacher?

I think that love was installed by my lecturers. We went on many tours and I love that practical aspect. I could really see the practical value of it so I think me wanting to show the pupils the world, is really important. So one of the aspects in geography is to learn about other cultures and travel. That I really thought was wonderful and they took us all over and I did enjoy that and I also happened to work with my husband as a scientist and I met him in that way, which was nice. So I really enjoyed that. So that is why I majored in geography, but then I also did an arts specialisation and a fine art degree which I really enjoy and I enjoy that.

In your view, what are the possibilities and challenges of teaching and learning Geography?

Geography is known as a hybrid subject and it is just that. I always tell children and I always love challenges. I always ask them what they want to be one day and they all me an accountant and I asked them how they would use geography to be an accountant. We then go through all the permutations. Time, planning, insurance cost, etc. and really at the end of the day geography comes into every single subject in some way or the other. Even if it is Afrikaans, look at the map, look at the language and how descriptive it is. If it's called Leeukuil River believe me there were lions there. So I tell them it doesn't really matter, geography can give you a greater worldview and it comes into every single subject. So I think it is a beautiful support subject. It is wonderful to study geography and have a special idea where you are.

I think because it's worldwide and it's very open it is inclusive to teach geography. It lends itself to every avenue. I love them to draw and paint and act and of course the one supports the other. In art… so when I teach geography I like to teach in that creative way. Having a river running through a school is amazing. I take kids out quite a bit. I miss not being able to go out on tours. I felt that in a government schools I had more freedom and the demand on children in a private school to achieve allows you less avenue to get out. That is what is amazing: to be able to get outdoors and get to do things like that. That's what I really enjoy.

Challenges for learners I would suffice it to say that anybody would probably pass geography given that they would come to school and listen. I'll tell you why because there is really a “for anyone” part of it. It is mathematical, as is maps with and calculations and the other half is historical and essay writing and another point is creative and if you pin which can actually not be marked incorrectly if you justify correctly. I have to give you credit for it. The Geography groups that set exams are extremely fair. It works on fact files so the kids won't be able to get it wrong. I think they are very comfortable in geography. The challenge might be for a child who studies a lot and they don't get there because you can't print the exam. So I enjoy teaching them

to think critically and the children are extremely engaged and they enjoy that. They find it is challenging and when they do research they get feedback from the real world in terms of a research project and we could do lots of work on the research project. Following the research project they do something akin to an apprenticeship. It is a huge challenge to them but once they are in it, we encourage them to go back to the teacher that they got their information from. I think that the scientific method that you do and any science subject formulating a hypothesis, getting data, representing data and analysing data is valuable. What I enjoy about geography mostly is that it is scientific. It allows creativity and many children can do well in geography.

Further challenges are if they are not mathematical and are forced to do that aspect. Especially girls. I know it is a huge generalization but it is spatial and they have to have a certain attitude to see certain things on a map and that is a challenge, but I really make it my business to teach them the patterns in class so they can see what they need to see. So I think that is a challenge but with technology and the ability to go into Google Earth and the impact that that modelling has, really makes it easier. It all depends on whether it is working and whether you can download it quick enough. It creates a little bit of pressure on the kids. I also encourage them to know what's going on in the outside world. The challenge is also what is happening at home and we spoke about real world examples and some of the kids can become very upset and they can be very excited and they are challenged by certain viewpoints and it gave me such a nice platform to discuss how things are so for me. It is an ongoing challenge that children only see things from their own viewpoint and geography allows you the avenue to say that there are different people in the world. There are different viewpoints and it doesn't actually matter what size shape or colour you are so that is when I do daily in my class.

How do you know that a teacher is teaching?

I would like to take the children for a term and teach them the entire subject while travelling and then give them to another subject. My goal is for them to see someone else's viewpoint. When I can see that there is a change in attitude. I believe when I can see that.

I've got a crazy thing in my class. It is an old Indian greeting: open mind, loving heart, let's work together. We do that practically so when one child speaks out of turn I asked him what part of love that is. For me to respect you, to listen to you, is love. So that's why we do that greeting. So I think I make it my business to see that there must be a change in attitude. That's me as far as learning is concerned because facts and figures can be found on computers and what can't be found is that deep change. so when children apply what I'm teaching and when they start to look from different viewpoints then I am happy. They have learnt and I think many teachers also want that. When a child has 40 then he has learnt but for me it is more important to get that value added so for me it's not just about emparting the subject only it is about the values that goes with it. I think my subject lends itself to that.

It is not just emparting and you must give them a platform to discover and research in their own way and at times we are bound to a curriculum but in that curriculum we can approach it in different ways. For example, the grade 8s can keep record on their iPad, cell phone, flip file hardcover book or diary, I don't mind. You can use any form that makes you comfortable but then there has to be some sort of sort of consequence if there is no work. Some people do prefer hardcover books and I suggested to them what I've done - I just require kids to have it. It doesn't matter in which way and I think today's generation just needs to do things in their own way. My job as an educator is to simplify things. When the kids are too busy to get anything done. I said to them: just simplify things. As an artist I'm going to tell you colour or sometimes I just tell them talking about something we can see everything. So children can see and I can see and they

learn in different ways and recognise their frustrations and I think for me going through this new method, for me, it was excellent. I could register my own frustration and immediately understand the kids better. Teaching the grade eights has been the most wonderful experience. When lessons are shortened then I can't close. I find learners are very frustrated. I realised what kids don't like. I like to call a proper close to my lessons and reflect on it and I think they leave your class feeling empowered. I think children learn in different ways but no matter what, I think that every child appreciates that that they are learning something and I make it my business to get to know the kids. Who's played what and scored a try and connect with them.

Do you think it is important to stick closely to the curriculum or is there leeway for innovation?

There is freedom for innovation, I think. There definitely is and yes we know that we are bound to a curriculum. The problem heads face is when a child moves from one school to another and one school has been very innovative and it's done things in a certain way and now a child moved to a different school. Now I'm aware of that in the back of my mind. While I certainly embraced things in a creative manner I'm very aware that that is a problem and that's unique and it's not for everybody. So, should we not try anything? Absolutely not. So one might think, the more creative you want your lesson to be the more organised you need to be. I approach it differently. I like to teach everything and then put it all together and say: that is what you have achieved; and then say: alright by doing this you have now achieved this and that and you can say: I can do it in a valuable way and that I can do it in a creative way. So at the end of having taught everything, I have covered the curriculum in a different way. So whether my kids dance or sing or however they want to impart the knowledge to me it is valuable.

We can say that the matrics get a syllabus and that hampers us because there is content and skills that we must get through and that is where you must have a very good subject head. Someone must think that and don't think as a junior teacher for matric. They need a certain skill. I've lectured at varsity and I can say to you that even if that is not correct. Having taught first year geology I detest the entire matric syllabus. So it's not true that you can't be innovative because you need to stick to the curriculum but to make the children feel secure is very important. If they don't trust you and don't feel secure they won't trust any innovation.

There have been significant developments in the field of educational technology in recent years.

I do definitely but not nearly as much as I want to. But I certainly see the value and specifically in my subject because it was so open and so wide I mean just to go on a simple thing like Google Earth is wonderful and one must always have your school keep up with it. So right now with the children I'm using it more as a hands-on in lessons. There are also beautiful games and I've also realised that learning is important in this way so I think it is absolutely invaluable. And that has grown with forcing myself to do things and now I realise. One has to keep yourself informed, always, I'm very fortunate to have people who can help me.

Have you used or heard about others that could contribute to teaching and learning concepts and procedures to be learned in geography? If so, which and how?

Accessibility all the time is so frustrating and we must get that right. When I trust the class to get things working and that is a huge frustration, but I've got to a point now where the grade 8s are marvelous. They know everything must be there and available. They know certain things must be all in order and that has allowed me to use tech more. So a couple of things has gone onto google classroom by the class and they've used it. As well, they've use text to do presentations but whether they use tech or whether they use old fashioned stuff I don't mind. So I think children enjoy learning and in order to get to them we almost have to get into the world, but I find that they need a balance. If you stick with youngsters that think that you are "with it" - with the seniors they walk into my class and they thank me because it is so peaceful in my classroom and then enjoy just relaxing. So there has to be a balance and I think you are being stupid if you say: "I'm not going to embrace tech and I'm not going to be doing it." So I feel like a grade 1 with it. So sometimes I feel like I'm strapped with time and I just want to teach and embrace and more so while I'm busy doing one thing. I can give instructions to other learners. I use it all the time to the children's strengths so is not necessarily quantifiable, I suppose, or visible. I don't mind if they're reviewing it or recording classes or if they are not doing it in all classes, but just being able to handle it - they must be comfortable and just show me that you're working on it. Just let me know. It doesn't even bother me, but it does bother me I think that I've got a lot to learn and I don't feel equipped. I have the tools and I'm out of other tools with time and I feel like the grade eights weren't equipped in the beginning and we were forced to the program and they didn't know how to use it and we weren't entirely equipped to show them how. So, that inhibited my ability and that is not my manner to make them feel secure. I like them to feel safe.

The HOD recently introduced a new approach to the geography team. How have you experienced the new approach? Has it brought about any changes to the ways you teach Geography?

Coming from the old guard I have always told her I don't want to compartmentalise the way that I teach. We teach concepts it is not new it is going back to thematic teaching which I think is a natural way of learning. So what we have done now is instead of going ABCD and by the end of it we are able to put together we have now put forward my point of view. I don't see children using tech as in always. I see it as how we are returning to the way we should teach know technologies used to support that

Have you made any changes to the framework

I have, but only now that we are up and running with it, making new changes and feeling more comfortable with it and knowing how to put it on. What made me extremely happy: I got a message from one of the grade eights saying thanks for putting certain things onto the site and I was surprised they actually looked at it. I could already see it leading to an exam question and this allows teachers to talk to each other now and make sure that we are up to date. So, instead of undermining someone you can put something on there and it drives all the grade 8s to check it out and it promotes that access and they look at it they will get better understanding. So, that made me happy, that indirectly a child has looked at something that someone put on and once the word spreads that's a teacher put something on there I could see the words but then it is better to look at it, that she would be best to look at it and they realised if Mrs Braithwaite

finds it valuable it probably is. I am still finding my way through it. I have not even in the smallest measure embraced it as much as I feel I want to, but I love the fact that I feel it's global and then I can access it. I love that I have no problem being open about it and I have no problem in saying it: I have no idea how to do it please help me.

It added to the way that I teach. Listen, didn't change it, I don't feel the way I taught never altered but if I take my way of teaching and I realise that this could enhance it then it is great. But to me it must never be a crutch so when the lights go down I must be able to still teach and I think that is the important thing. It is archaic to think that if half the lights go out half your teachers can't teach. It is reaching children where they are at and we need technology to get to that. I would like some time to sit and just play with it and then there's the day that I was actually playing with it that I started learning. I think that I would embrace it more if I had more time but I have put a target to it for myself to even look at a little bit more.

Would you recommend this kind of semi-structured to other teachers?

I would certainly want them all to carry knowledge of how you can get the class involved, if nothing else. That is what I feel makes it valuable. It has given a very insignificant kid in my class an opportunity to put something on a site and the rest of the class will look at it and that is giving them an opportunity that otherwise would not have happened in The Old Way. I think that that's great and for me to be able to put one notification onto the whole group has been great so I've started doing that, which is wonderful. So I think, then, individually it has allowed a child to shine to all his classmates and then collectively it's cut down my load once you know how to use it. Now they realise that I am using it and I think it is at the beginning of really taking off so, yes I would recommend other teachers to certainly use it. It would be wonderful If we were all on it.

Appendix 6 – Teacher 3 Interview (Transcription)

Give me some background of your experience as a teacher.

I think this is my 34th year and a lot has changed. It's hugely different. I'm enjoying the technology. I'm not a techno fundi, but I love the visual. I would have loved the visual because I am a visual learner and I've already experienced it to be a hundred percent better than any other school I've been to, but it is my 13th year here. The first time I saw that 3 hours work could be done in 5 minutes I was in tears, but what a massive jump and technology!

Teaching was just my default. I didn't have a clue what I wanted to do and I thought: "Just be a secretary, start making money." My parents didn't have a lot of money and I remember how people came around to our school matric group and they said and they needed teachers and my parents said you need to get something behind your name and they will pay for you. I remember phoning my parents twice saying I don't want to do it. I don't think we did teaching pracs in my first year but we did it in my second and third year and then I realised by default I am in something that I absolutely enjoy. For me it is nice to teach history. I've mostly taught English until I got here but it is engaging with the kids that I really enjoy. I much prefer the juniors with the new trend and behaviour; the sense of entitlement and parent demands, you know, you are just an extension of home servants. That, I really battle with. That, and I love the juniors. They are less structured. I have recently been diagnosed with ADHD. Apparently I've been all my life. I am not a very organised person. I try but it is a constant battle. Now that I'm medicated I'm a bit better but I think it doesn't matter, because it works with my students, because I can act things out and I can play. My principal is great. He doesn't think that we have to stick to the syllabus that much. We are developing the child. My school has been an absolute eye-opener for me and in many ways I have been criticized all my life. I've been told that maybe I shouldn't go into teaching and I remember talking to someone saying how good it is to be somewhere I'm accepted. A deputy head told me that they employed me for my strengths and not my weaknesses. I'm getting to the end of my teaching career now, I think because co-curriculars drive me nuts. I want to be in the classroom. I've enjoyed the co-curriculars but my ideal now would be to teach and mark in the afternoons, because I am a bit slow and disorganised so my weekends wouldn't be impacted. I would then actually have a family life.

Thank goodness I went into it. I always wanted to be a doctor but I didn't get the marks and my parents wouldn't have been able to afford it. I was a bit bitter and resented it initially but once I started… Well this just gels with me.

How and why did you decide to become a Geography teacher?

Geography was a default. I did History and English as majors and I also did psychology. I went to go do the degree course at Wits and we were exposed to all the subjects on and off throughout my career. It's one of those things, especially in the social science, where I got into it. I've always enjoyed geography. I've enjoyed learning about this planet and there are so many concerns around it. So, for me, Geography is such a logical subject. I loved it at school but I didn't pick it up as my major because History and English for me just belonged when together in my head. So, when I came here they needed me in geography and history so I went back in. So, it is a subject that I enjoy and everything was by accident.

In your view, what are the possibilities and challenges of teaching and learning Geography?

Teaching possibilities: I think the technology is amazing. In the senior grades, with the talk about Google Maps and aerial photographs there is so much visual potential now even the juniors now. You have movies, you have dramatic images that you can give them and they (the images) can take them there as the next best to actually taking them there. From seeing a volcano erupt or whatever and there's so much happening on the planet. Technology, so much, lends itself to it. I would often go totally off the set work and go to something that is current and that would illustrate what I was trying to teach them. One of my kids is already working with an NGO because of connections in terms of this world. Challenges are to try and get together to think and to get through your lesson planning and they think it's rather boring but actually it's not boring. History and geography, I tried to teach it from a point of relevance. I tell the kids: "Don't worry about the dates. Let's talk about why…" The same as geography, it's not all about stats. There are some things that I just thought that are on the ball with the system that she (HOD) is trying to bring on. The shame with this whole year's work. It has already been done in one term and we now re-apply and reapply it to countries all over the world and it's really making a difference. It is such a lovely way to be doing it. There are challenges. It's got a very very difficult generation that we are teaching. It's part of the challenge to try and expose them to problems and issues. Especially children from well-to-do families. It is quite difficult, sometimes, because they are so self absorbed just because they have never been encouraged. For instance, not cleaning up after themselves. They don't pick up a packet or a thing because they have servants at home, so that is a tiny microcosm. So I think the challenge is the teenagers themselves. To really teach in such a way to make the subject relevant and we need good people in this world out there to keep everything on track. There's such a burden on geography teachers, as much as on biology and science. We need to send people out there who know. That is what I see as my challenge, personally.

Possibilities and challenges for learners, at the moment. They see it as another learning subject and some find it too easy and don't take it seriously and even my principal undermined the subject, by saying that it is easy. I don't think passing geography is a challenge - I feel in the teaching of it, if it is not taught very carefully and a difficult concept, can be made difficult by the teacher and put them off. It is not a subject that is in the forefront of their minds. Children who come from poor quarters find it easier. They knew all about it, like a bursary kid. The damage of littering and some of the kids who travel have seen things, but it is just to make it possible for the kids to grasp the picture in their heads. The junior stages i've found too many challenges: the biggest one that I hear a lot is that they get bored so I try and work with that. I think they get your point where they are under so much academic pressure. The critique of what kind of job you can get with geography, they are not really exposed and parents have traditional ideas that they must be a doctor or an attorney or an engineer. It is not as bad as it was years ago but it is still there. I think children's take on art has the same challenges where they want to do it but their parents don't allow them to. They say it's pointless so they have stereotypical pre-existing ideas about it and I think it has the geography syllabus' fault and that is why I'm actually trying to make a difference. It is taking some of the boredom away from the kids and they have certainly enjoyed doing geography this year moving to different continents or countries, doing the same things, but they start feeling more comfortable.

How do you know that a teacher is teaching?

I think how you engage the children and what they are learning from you. I would say the way you would judge from the children's responses, their comments and how they react. Each child reacts to you differently. I'm very glad when very little comes back to me (negative feedback). I like constructive feedback. That is the crux: if you engage. What it means to engage students and what it means to see every child and not just a subject. Teaching is not the subject. It is building lives and so if you are... if you make the child... I've always said my children must want to come here. It mustn't just be about the subject content. This must be a happy space. This must be a space where they can experience learning and the joy of being with peers and not see me as a massive threat over them. I don't like shouting and screaming as my discipline measure, but I still have a disciplinary system. My learners are allowed discussion and debate even when we go off the topic - as long as it is relevant to the kids. This ticks so many boxes for me: then I have done my job. In a year if I can reach one child like that.

Very intellectual teachers are amazing in their knowledge, and the emotional side is hard for them. So it was easy for me. I love that mothering side of teaching. For me, the worst thing in teaching would be to hear that children don't want to come to my class. I would resign. That would be the day that I know I'm doing a lot wrong. Once you have gained their trust they would want to listen to you and they would want to please you. I have naughty kids but I love them. Once they realised you care for them, for the most part they will respond in kind - that for me is what teaching is.

Do you think it is important to stick closely to the curriculum or is there leeway for innovation?

It looks like it, certainly in the junior grades, the ones that I am teaching in geography. I think you've got quite a bit of leeway. I'm not sure if my geography department actually loves the way I will always teach according to my agenda. I listen to my HOD but she's never loomed over me, but they let me do my thing in my own way. What is fun and Geographic I think it's very important, this leeway, because you are developing minds at the same time and if what you're teaching leads to a different discussion that is relevant, allow it to go there because children need a space where they have a voice. It will still be Geography related, unless it's a special circumstance, when I will negotiate. But I don't think it is a teacher's prerogative to do that all the time because they are here first and foremost for an education. I think you need to feel your way because no day is ever the same. We have a lot of leeway in the junior grades. I see my challenge in the Junior grades is to build a passion for the subject. If I'm looking at it academically, that will help them decide whether they take it on or not. It might be a child who would absolutely love geography but it's never been a desire to know more. He's never been stimulated to feel that way. You can't do that with every child but that is the take that I take when I stand up in front of a classroom. I try and vary things because I tend to talk too much. I try and really be mindful. I tried to do and build and make it real for them. It definitely feels like I have the space to innovate.

There have been significant developments in the field of educational technology in recent years. Do you use any in your teaching?

Google Classroom I use the whole time. I love it. I created my classroom, I put my things up there and sometimes when you want them to hand in work, they hand work in on it. I love it. I absolutely love it. Like even with what they'll do: I'll say to them here is your assignment,

workout your groups, here is your rubric, and what you need to do, and your instructions. Now you gotta go in your groups and film. You are gonna create a play about this. I would do it in much more detail for them. I'll mark it while everybody is watching. Genius because kids get so stressed about standing up and front of each other. They love this way of doing it, they are using technology. I learnt so much from them. I don't use a lot of variety because I don't know a lot of it. I know there's a lot out there and you need to be brave and I'm getting there. Google Classroom is a lovely innovation and I've really been getting into it and it is so accessible I just love that. If three out of all my classes know something I can message one child and ask them to put an announcement on classroom and then everyone has access to it. Information sharing and communication - I even love or WhatsApp groups. I am very wary of them since we've heard what can go wrong. I love children to know that I am available, and emailing of course and emailing me assignments is a lot more user friendly than some of the other systems we've used. Some of them are off site and they can't access things so I'm finding that side of things making my management easier. I can see if things are coming in on time because I am not such a time fixed person myself. I'm quite lenient. But these things I don't tell them: that I think it is really unfair being hard and fast. Provided they have communicated with me and that is what they do, mostly. Technology keeps my hand on the pulse. Kids can't always hand things in on time. I probably could be doing much more but I don't know...

Have you used or heard about others that could contribute to teaching and learning concepts and procedures to be learned in geography? If so, which and how?

Not so much in the junior phase. At one stage I know people wanted to do lessons online, that they could connect to it. That sometimes grips them because they got the technology in their hands, because they are teenagers and they have technology I think it would be fabulous. I just don't know everything. I know there is stuff out there, I just need to explore it or I need to be taught it.

The HOD recently introduced a new approach to the geography team. How have you experienced the new approach?

I think it took us a little while to get going. I hate being overwhelmed, but she said that it would be phased in. We are so used to a traditional way but I can see and I'm scared if I taught it a certain way: what if they don't get it properly? So I had to break away from the traditional way of teaching, had a bit of a mental block, but it is gaining momentum for me and it has been getting better and better. It is really better.

Has it brought about any changes to the ways you teach geography

It's just highlighted for me, that working through things, that putting things in practice is the learning part. Not just learning it in your head. I used to do it with some things, anyway, but not quite with so many things. Where you spread it over a year, but now they've also got it now they're just repeating it and teachers are scared that what if they haven't done it properly, but this works much better and next term their going to do it in another country and again and more countries… It is what Geography should be. It is not about learning alone but also understanding.

Have you made any changes to the framework

No, not really. I think I've put on one document myself. I know she wants us to change it but I'm also across a number of subjects. It's not an excuse but it's part of it. I need to

make more headway. Even though I haven't made changes to the framework it is positively impacted the way that I teach, I think that's what our HOD wants.

Would you recommend this kind of semi-structured to other teachers.

I definitely would. I told my other department that we must do it in history. The kids almost love it and it will start sharing experiences even personal experiences. Then other kids become more interested. It stimulates very relevant discussions in the classroom and debates are fun. As I'm walking around and helping them you are less in the front of the class and more with them, working with individuals and groups. A lot of kids are shy and scared to ask and then this way it helps them as well, because I can walk around when I see they're not coping and I can work with them individually. It opens doors on a number of levels it depends on the personality of the teacher too. I know other teachers are not comfortable because they need to know that they've got the right marks, but I felt free so I can be a rebel. Sometimes I don't do it because I am taken by a different concept. And my HOD is fine with that, because you want to inspire the kids and you cannot say that something is not relevant. I vowed never to be the teacher that cannot see the thing from a child's perspective. You need to remember what you're a teacher and you are teaching human beings, very vulnerable human beings and often they don't have a safe space at home and this needs to be that save space and you need to teach them accountability. If that approach was taken with me in school I might have even though I might have done even worse but I believe in it now.

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