



An investigation of pedagogical change with novel technology in fee paying and no-fee schools during COVID-19

Anil Kanjee

School of Education, Tshwane University of Technology, Pretoria, South Africa
KanjeeA@tut.ac.za
<https://orcid.org/0000-0003-0161-0233>

Joanne Hardman

School of Education, University of Cape Town, Cape Town, South Africa
Joanne.hardman@uct.ac.za
<https://orcid.org/0000-0002-1592-7357>

(Received: 9 May 2023; accepted: 29 February 2024)

Abstract

Following the reopening of schools after the national lockdown in March 2020, the Department of Basic Education (2020a) in South Africa implemented the School Reform Plan to mitigate the impact of the COVID-19 pandemic on the loss of learning and teaching in schools. To date, limited information is available on the extent to which these measures have had an impact on pedagogical practices of teachers across the different poverty quintile schools. In this paper, we report on teachers' perceptions of how novel technological tools, introduced during the pandemic, altered their pedagogy practices across no-fee and fee-paying schools. Data was obtained from 1098 teachers and analysed using Engeström's (1987) Cultural Historical Activity Theory as the framework. Findings indicate that two broad, ideal pedagogical types, reinforcement pedagogy and collaborative pedagogy, emerged in both no-fee and fee-paying schools from the use of technology in schools during the COVID pandemic. While reinforcement pedagogy is motivated by the need to cover the curriculum, the motivation behind collaborative pedagogy is to develop learners' understanding of concepts in class.

Keywords: pedagogical change; technology; COVID; schooling

Introduction

In March 2020, the world came to a standstill when countries went into lockdown to avoid transmission of COVID-19, a deadly virus that had spread around the globe. In South Africa, in response to this shutdown of economic and scholastic endeavours, the Department of Basic Education (DBE) implemented the School Reform Programme (SRP) to mitigate the impact of the pandemic on learners' conceptual development in schools (Department of Basic Education, 2020a). Curricula were trimmed and assessments were minimised against the

background of a revised school calendar and rotational timetabling. Significantly, where connectivity and devices were available, schools turned to Information Communication Technologies (ICTs) to teach in the absence of face-to-face classrooms. These novel technologies ranged from using mobile phones for WhatsApp messages to using static computers to deliver content via Google Classroom and other similar apps. While the pandemic undoubtedly had a negative impact on education, it also provided opportunities for educational change. Acknowledging the opportunities presented by the pandemic, Sayed and Singh (2020) called for the rethinking of long-held education dogmas and suggested possibilities for reconfiguring education in new and different ways. Similarly, Soudien (2020) and Ramrathan (2021) argued for restructuring the education system to focus on learning as cognitive development, rather than on the reinforcement of knowledge already learnt.

In a recent study, Kanjee and Ramollo (2023) found that the new measures introduced in the SRP allowed for a more conducive teaching and learning environment with the potential for supporting expansive transformation in teachers' classroom practice. However, the authors called for additional research on whether the intent advocated in the SRP and the available capacity for supporting teachers across schools in the different poverty quintiles could lead to sustained change in their pedagogical practices. In their study of pedagogy under COVID, Vale and Graven (2023) found that the pedagogical strategies used by teachers include the use of technology for communicating with parents and learners as well as for providing extra materials and exercises for learners to complete at home. These authors also found that the specific strategies used across high resourced (fee-paying), and low resourced (no-fee) schools varied.¹

Our interest in this paper hinges on the use of novel technologies introduced during the pandemic for teaching and learning. Given the possible teaching and learning opportunities afforded by these new technologies, we are interested in investigating the extent to which the novel tools led to changes in pedagogical practice. Understanding that novel technology has the potential to impact pedagogy and, consequently, learning, we focus specifically on the opportunities opened by the pandemic in relation to (i) the use of new tools, and (ii) the impact these new tools had on pedagogy. The question we ask in this paper is:

- What are teachers' perceptions of how novel technological tools altered their pedagogical practices across no-fee and fee-paying schools during the COVID-19 pandemic?

Literature review

We are concerned here with changes in pedagogical praxes in a time of unprecedented crisis during which the lockdown of schools forced learners and teachers to move online to learn and teach. Here we outline what pedagogy, broadly conceived of, looks like in schools. There

¹ To implement a more equitable funding policy, schools in South Africa are classified into quintiles, from most to least poor, based on the socio-economic status of the catchment area (see Sayed & Motala, 2012). Schools categorised in quintile 1 to 3 are exempt from charging fees and are hence referred to as no-fee schools, while schools categorised in quintiles 4 and 5 continue to charge fees and are referred to as fee-paying schools.

are two poles of pedagogical practice; on the one end is the understanding that passive children learn through facts being transmitted by the expert teacher, and, on the other end, is the notion that children are active cognising agents who learn through acquiring knowledge through interaction with a more expert teacher. The former understanding is referred to as transmission pedagogy and the latter as acquisition pedagogy or, in other words, teacher-centred and learner-centred pedagogy respectively (Sfard, 1998).

Much pedagogy that we see in South African schools relies on a view of pedagogy based on the transmission of content from the more expert teacher to the less expert learner (see, for example, Hoadley, 2017). Essentially, the latter view sees education as geared towards the reproduction of a known body of knowledge and the school-going child's cognition is seen to change quantitatively over the schooling period, but not qualitatively; the child has more content in their head, but new cognitive structures have not been formed, nor indeed, are they necessarily seen by teachers to be desirable. Pedagogy in such a lesson, therefore, has the teacher leading the classroom in generating closed questions that elicit known content answers from the learners (Hardman, 2021). In this scenario, a traditional Initiate, Respond, Evaluate (IRE) sequence is generally followed by the teacher asking questions and eliciting known answer responses (Coulthard & Sinclair, 1975). Where feedback is not elaborated and dialogue is not developed, teaching in this mode can lead to rote learning, with little to no conceptual development occurring. We note, however, that the IRE sequence itself is not problematic. Rather, it is how a teacher uses this sequence that determines whether knowledge and new cognitive structures are acquired or not (Cazden & Beck, 2003).

The second type of pedagogy we discuss in this paper refers to acquisition pedagogy, in which the child is viewed as an active cognising agent who constructs knowledge through engagement with meaningful activities with more knowledgeable others. The thrust here is on recognising that conceptual acquisition is developmental. The foundation for this thinking lies both in the West and in the East with Piaget (1976) claiming that children learn actively and Vygotsky (1962/1986) illustrating, in the Soviet context, how learning precedes development.

Research indicates that the COVID pandemic had a profound impact on teaching/learning in schools with Mutton (2020) identifying three challenges—access, engagement, and participation—in his study. The use of a novel tool, in the form of mobile technology or static computers, challenged teachers and learners to engage with each other in a way they had not done before. There was no access to face-to-face lessons in the sense of a shared physical space and many children were unable to access any educational assistance since they lacked the necessary data for connectivity. This meant, of course, that participation in online learning was largely the preserve of those who had the means to possess not only the devices for online learning but also to pay for WIFI and data. In the no-fee schools in South Africa Mutton's challenges were apparent. Given that these schools had no money to buy data, there was no possibility of online connectivity so participating in online learning was impossible. However, in this paper we seek to understand how pedagogical praxes changed during the

pandemic when ICTs as learning/teaching tools could be used. To understand pedagogical change, we draw on the Cultural Historical Theory of Vygotsky (1934/1978; 1962/1986) and the development of this in Engeström's (1987) Cultural Historical Activity Theory (CHAT) as an analytical framework.

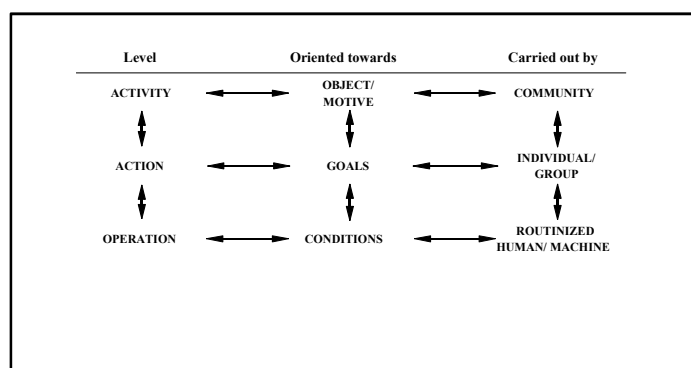
Cultural historical theory and Cultural Historical Activity Theory

For Vygotsky (1934/1978; 1962/1986) higher cognitive functions are developed through social interaction; what is developed initially between people becomes internalised over development. This is encapsulated in his general genetic law that indicates that every experience the child has is mediated through culture before becoming internalised. Vygotsky (1962/1986) distinguished between two kinds of concepts that are crucial for the developing child—scientific (or abstract) concepts and every day (or experiential) concepts. While abstract concepts need to be taught, spontaneous everyday concepts are learnt empirically.

From the dyad to the collective

While Vygotsky (1962/1986) clearly recognised the importance of the social world in development, he did not conceptualise collective activity in depth. Leontiev (1981), his colleague, took up the challenge of situating (individual) action within a collective activity. While individual actions are goal directed, collective activity is motive driven. To understand the individual action, then, one would have to know what motivates the entire activity. This is represented in Figure 1.

Figure 1
Leontiev's conceptualisation of collective activity

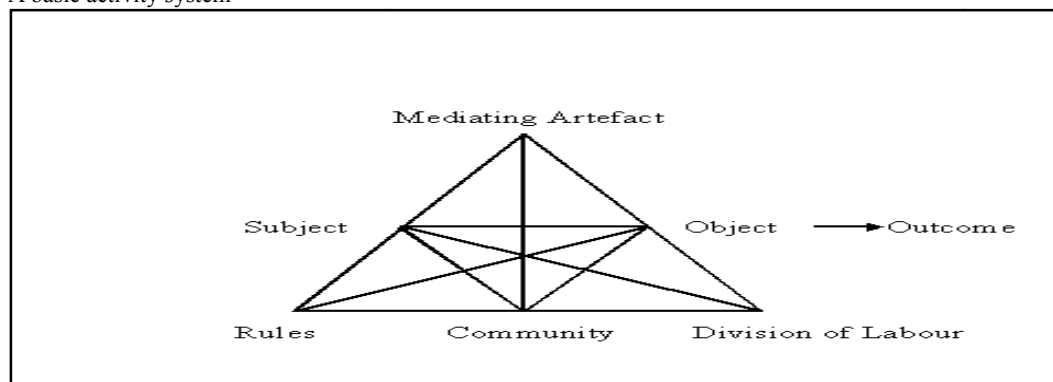


(Source: Daniels, 2001, p. 87)

While Leontiev's work situates an individual within a collective, his conceptualisation of what constitutes an activity is not elaborated. This task was taken up by Engeström (1987) in his PhD work in which he described human activity as a system. Figure 2 illustrates graphically Engeström's conceptualisation of an activity system, in its simplest form.

Figure 2

A basic activity system

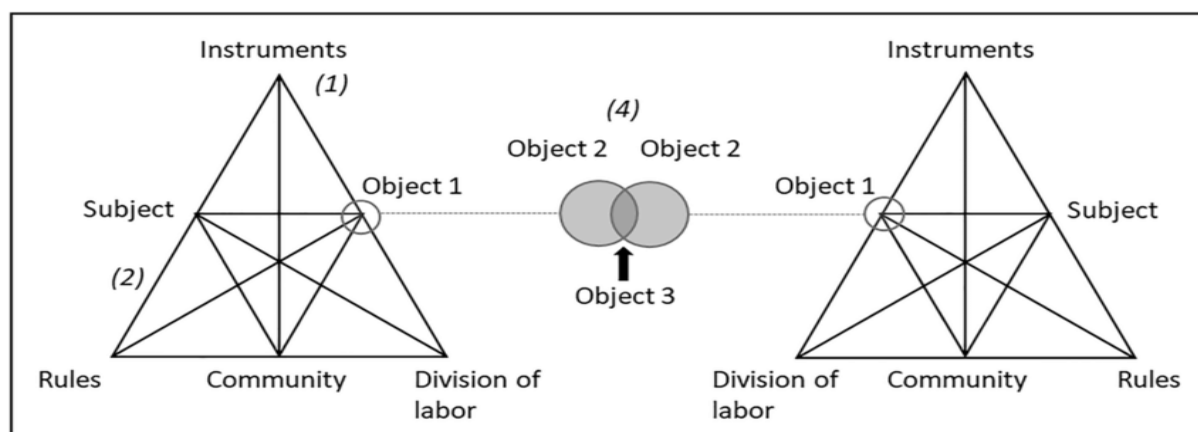


(Source: Engeström, 1987, p. 75)

In this basic system, a subject, for our purposes here, a teacher, acts on the object (that motivates the activity), in this case, the learners' acquisition of knowledge, using specific instruments or tools to accomplish this. In the case of ICTs, the tools used would be technological in nature, such as a mobile phone, for example. Actions within an activity system are afforded or constrained by the rules of the system as well as by the division of labour in the system. The community refers to those people who share the object of the activity system. (Figure 2 illustrates a very basic activity system.) No activity system, however, operates in isolation. All subjects are part of their own activity systems that influence their actions within systems. Figure 3 illustrates the multiplicity of activity systems of which we are all part when activity systems interact in the completion of any collective endeavour. Change, in this theoretical framework, results from contradictions within nodes of the system or between nodes of the system that force dynamic change in the system.

Figure 3

Multiple activity systems interacting



(Source: Engeström, 2001, p. 136)

Contradictions

Like Vygotsky's (1934/1978; 1962/1986) work, Engeström's is based in a dialectical, as opposed to a binary logic. Rather than conceiving of mind as distinct from society, for example, Vygotsky conceptualised mind *in* society. When novelty is introduced into an

activity system, routine ways of acting and being can shift at least potentially because of the contradictions that arise between, within, and across systems. Contradictions should not be conceived of as negative spaces; these are dynamic sites of change that force the system to change to meet the challenges emanating from the contradiction. However, contradictions need not lead to progress; one can regress to former fossilised ways of acting if the contradiction is not dealt with.

New technology, new pedagogy?

A review of literature regarding the impact of ICTs as teaching/learning tools indicates that it is not technology itself that leads to gains in learning but is, rather, the pedagogy that underpins it (Hardman, 2008b; Ibáñez & Delgado-Kloos, 2018). With this in mind, we draw on research carried out by Hardman (2015) into pedagogical change with ICTs in primary school as a basis for developing our methodology. Findings from this study indicated that the pedagogy in the computer-based lessons was entirely transmission based and there was limited engagement with learners, which does not lead, of course, to conceptual attainment). While this finding is troubling, we note that much of the software to which teachers had access at this time was drill-and-practice software that lends itself entirely to a transmission mode of delivery. Different tools, such as mobile devices and different types of software, such as gaming software, for example, can lead to very different pedagogical outcomes.

In this paper, we seek to understand pedagogical change during the COVID pandemic by using a CHAT framework to explore teacher perceptions of pedagogical practices across no-fee and fee-paying schools.

Methodology

The study on which this paper is based forms part of a larger project called “Determining the impact of the COVID-19 pandemic on teaching and learning in schools and Initial Teacher Education Programmes” conducted by the Assessment for Learning Research Niche Area at the Tshwane University of Technology. This project focused on two aspects under the COVID-19 pandemic: (i) the teaching and learning experiences of learners, students, teachers, and lecturers; and (ii) innovative pedagogical practices that have been implemented to enhance teaching and learning. In this section we outline the methodological details informing this paper. We employ CHAT as a theoretical lens within a qualitative paradigm to analyse our data. We use both quantitative and qualitative methods, drawing on closed and open-ended responses to survey questions.

Sample

Data was obtained from 1098 educators, of whom 64% were teachers, 19% Heads of Departments, and 17% deputy/principals. All indicated that they had taught at least one class during the COVID pandemic. Of these, 78% were teaching in a primary school, 13% in a secondary school, 6% in a combined school, and 3% in schools of specialisation. In addition, 79% of respondents were female and 21% male, 64% taught in no-fee schools (i.e., schools

categorised in quintiles 1 to 3) and 36% in fee-paying schools (i.e., schools categorised in quintiles 4 and 5), while 46% taught in rural schools and 54% in urban schools.

Instruments

For the larger study, the instruments were adapted from United Nations Educational, Scientific and Cultural Organization's (UNESCO) International Teacher Taskforce framework (2020) for supporting teachers and other staff when schools opened during and after the COVID-19 pandemic. In addition, the teacher questionnaire used in this study also drew on two key documents released by the Department of Basic Education to mitigate the impact of the COVID-19 pandemic: (i) The School Recovery Plan (SRP) in Response to COVID-19 (2020a) and (ii) The Teacher Guidelines for Implementing the Revised Annual Teaching Plans (2020b). In total, the research team developed the following instruments: a document review schedule; a student questionnaire and interview schedule; a teacher/ lecturer questionnaire and interview schedule; and a School/University manager questionnaire and interview schedule.

For this study, the teacher questionnaire was comprised of four sections containing Likert scale items as well as several open-ended questions. Section 1 was comprised of demographic data. Items in Section 2 focussed on respondents' views regarding the impact of the new rules introduced in the School Recovery Plan (2020a) and The Teacher Guidelines (2020b) on their pedagogical practices as well as on their learners' learning. Section 3 solicited information on respondents' perceptions regarding the impact of the revised curriculum and the revised assessment guidelines on their pedagogical practices. It is this portion of the survey that informs this paper. Specifically, we used qualitative open-ended questions in which teachers were asked to comment on, in this instance, what new tools they had used as well as the impact this had had on their pedagogical practices.

The content and construct validity were determined by mapping items to the key guidelines listed in the DBE documents that had an impact on teachers' pedagogical practices to the formative assessment approach (Kanjee & Bhana, 2022) advocated in the DBE Teacher guidelines as well as the Hoadley (2017) study. In addition, the online instrument was also piloted, first with two research team members who were not involved in developing the instrument, and thereafter with two teachers. Comments provided by these respondents were used to revise items before the online survey was circulated. The Cronbach alpha for items regarding respondents' receptions and views of the new rules and guidelines on their: (i) pedagogical practices and learners' learning was 0,849; (ii) implementation of the revised curriculum was 0,807; and (iii) assessment practices was 0,804. Section 4 requested permission and contact details for a follow-up interview. In accordance with the Protection of Personal Information Act of South Africa only the Primary Investigator had access to contact details, and these are stored on a password protected computer. While interviews were also conducted, this paper does not focus on them, but, rather, on the survey's open-ended questions.

Data collection

Given the COVID lockdown restrictions, data was collected through an online survey that could be completed using a mobile phone or a computer. Snowball sampling was used since it was the most effective mechanism for reaching out to teachers who were able to access the online survey. The survey link to the online survey was sent to individual teachers and teacher groups, as well as to district officials in all provinces to circulate among their local teacher groups.

Coding and analysis

We focus here on an analysis of the qualitative responses of teachers that emerged from the open-ended questions in the survey. These responses were coded using the nodes of an activity system triangle, viz. tools, rules, division of labour, community, object, subject, and outcome. The focus of this analysis was to determine whether pedagogy varied across no-fee and fee-paying schools under the COVID pandemic restrictions. We used the following checklist when analysing the data.

Table 1
AT checklist

CHAT concepts	Questions to ask the data
Outcomes	What is produced?
Mediating artefacts/tools	What tools are used?
Rules	What are the rules in the classroom?
Object	What motivates the activity? What is the teacher working on? Why is s/he is working on this?
Community	Who shares the object?
Division of labour	Who does what? Who determines what is meaningful?

(Source: Hardman, 2007: p.7)

Ethical approval

Ethics approval for the study was obtained from the University Research Ethics Committee.² In addition, permission for data collection was obtained from the National and Provincial Departments of Education and consent was sought from all participants in the actual survey where they were asked to consent to the study.

Results

In this section, we present the findings, using CHAT as an analytical framework, to obtain a deeper understanding of teachers' perceptions of how novel technological tools altered their pedagogy practices across no-fee and fee-paying schools. First, we provide an overview of teachers' use of technology across these schools. (Figures 4 and 5 represent these findings.)

Figure 4

Computer literacy of teachers in no-fee vs fee-paying schools

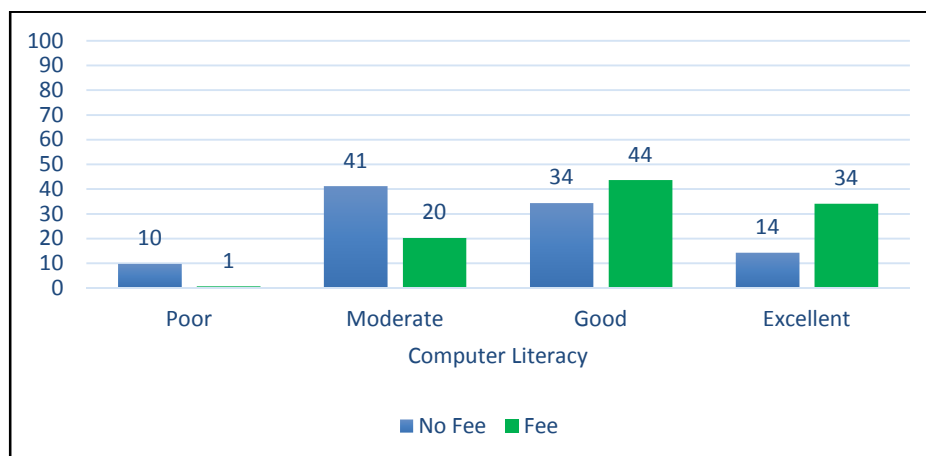
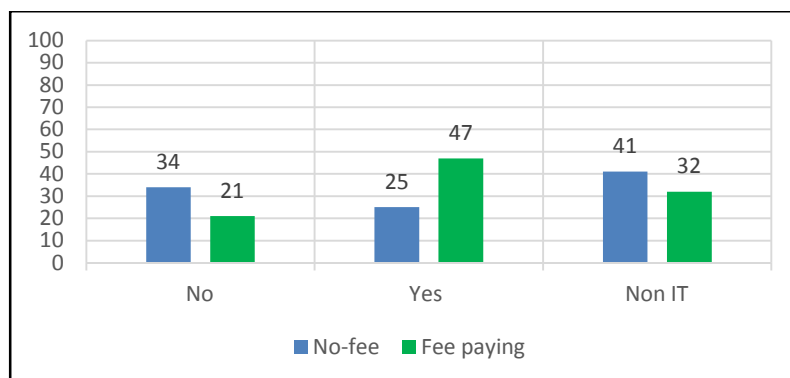


Figure 4 illustrates the level of familiarity regarding ICT use in fee-paying versus no-fee schools. These results indicate that 44% of teachers in fee-paying schools reported that they had good ICT skills and 34% noted that they had excellent ICT skills. Contrasting this with 34% and 14% respectively of good and excellent ICT skills reported by teachers in no-fee schools, one might well anticipate that teachers in fee-paying schools would be more likely to use ICTs for teaching. Moreover, these schools also have greater access to ICT resources and are able to afford connectivity and devices. While initiatives like the Khanya project in the Western Cape (2000–2004) saw computers delivered to some well-functioning, no-fee paying schools, there is research indicating that connectivity and access to devices is lacking in schools in lower socio-economic areas where no-fee schools are located (Mukuna & Aloka, 2020)

Figure 5

Use of ICTs to develop new pedagogy by teachers in no-fee vs fee-paying schools



As noted in Figure 5, 47% of teachers in fee-paying schools indicated that they used ICTs to develop new pedagogies during the pandemic as distinct from 25% in no-fee schools. It is interesting to note, however, that non-ICT tools were used more in no-fee paying schools for pedagogical reasons (41%) than ICTs (25%). This should not lead to the conclusion, however, that ICTs did not alter pedagogy in no-fee schools. As we will show in the analysis that follows, two distinct novel pedagogical types emerged from the data and surfaced in both no-fee and fee-paying schools.

Pedagogical practices emerging from the COVID pandemic

Two activity systems, representing two distinct types of pedagogical practices, emerged from the data. The first system, following Hardman (2008, 2015), we have called collaborative pedagogy. The second system we refer to as reinforcement pedagogy. Earlier in the paper we described two broad modes of pedagogy—transmission versus acquisition pedagogy and we note here that collaborative pedagogy can be seen as acquisition pedagogy while reinforcement pedagogy has many features of transmission pedagogy. In what follows we describe the two modes of pedagogy in relation to the data we analysed.

The first system

The first activity system that emerges from the data is categorised by an active stance towards learning and is motivated by the teacher's desire to develop conceptual understanding.

Subject

The subject in this study is the teacher acting with technology. Teachers' beliefs and theories about what constitutes good teaching influences their actual practice and hence, an understanding of teachers' beliefs in relation to teaching with technology during the COVID pandemic is important to understanding the possibility of pedagogical change. In the type of pedagogy that we call collaborative, teachers described their pedagogical theories as active, individual, one on one, and, in many instances as learner centred. In extract 1 below Teacher A, an experienced teacher from a fee-paying school describes her view of teaching.³

Extract 1: Subject position: understanding of learning as active and collaborative.

I am an experienced teacher who believes in hands on practical activities and doing research and planning to ensure my lessons are best for the kids' learning experience. This continued to apply even with the changes in teaching. (Teacher A, female teacher with 22 years' experience: quintile 5 urban school)

Teacher A understands that learners are active cognising agents. Earlier in the paper we referred to two broad modes of pedagogy, transmission versus acquisition. In this extract and the in extract 2 below from an experienced teacher in a no-fee school, we see a view of pedagogy as one of acquisition by an active child.

3 None of these extracts has been edited.

Extract 2: Active learning.

Became more active in the classroom because some lessons required demonstrations.
(Teacher B. Female teacher, 26 years' experience: quintile 1 rural school)

Of interest in these two extracts from the data is that both teachers have a lot of teaching experience but are in extremely different schools. Teacher A teaches in an affluent quintile 5 school and teacher B in a rural quintile 1 school. The difference in context and quintile of school, however, has not led to different pedagogy in this instance since both teachers report their pedagogy as being more active than it was prior to the COVID pandemic.

Tools

Tools are the artefacts that are used to work on the object of the lesson. In collaborative pedagogy teachers make use of a large variety of hardware and software technological tools. In our survey, teachers discussed using tablets, laptops, radios, videos, WhatsApp, Facebook, class DoJo, and other technological tools to reach and teach their learners. It is important to note that the software used here, such as WhatsApp and Facebook, lends itself to a level of interaction that a static drill-and-practice piece of software does not permit. Of interest is the finding that interactive tools like WhatsApp facilitated more collective than individual engagement.

Extract 3: Harnessing the assistance of peers: The group as tool.

Teacher C, female teacher with 5 years' experience: quintile 3 rural school.

We have grouped the learners according to their abilities so as to have more time with the slow learners, by doing that the slow learners improved although it was a heavy load to the teachers because the repeat the work many times (Teacher E, female teacher with 28 years' experience: quintile 2 rural school)

I used cooperative learning, for example, grouping the learners with strong abilities with the less abilities. Using technology in class to accommodate each and every learner since learners are individuals and have different styles of learning or acquiring information, example would be using a projector to show them a video of counting in groups of two and Tens and Units (Teacher F, female teacher in her first year of teaching: quintile 5 urban school)

What extract 3 points to is a novel kind of pedagogy that is collaborative, as opposed to being solely didactic. Note also that the teachers created groups with learners who were more expert in a particular area joining those who were less expert. This is an example of Vygotsky's notion of mediation in the Zone of Proximal Development, where the more competent other guides the novice during concept acquisition. It is also interesting to note that learners were encouraged to talk together in problem-solving (see Hardman, 2023; Knight & Mercer, 2015).

Rules

Rules mediate between the community and the subject. One rule that changed significantly according to participants in this study, was the rule about pacing. While pacing in a lesson is traditionally controlled entirely by teachers, we see a shift in this. In the collaborative type of pedagogy, the teachers slowed the pace to keep learners engaged with the work. There is research evidence that slowing the pace of a lesson, while explicating the evaluative criteria for adjudicating what counts as a correct answer, leads to better attainment in schools (Hardman, 2023).

Extract 4: Rules of pacing

Due to fact that learners were fewer I could spend more one on one with them especially those who struggle (Teacher G, female with 28 years' experience: quintile 1 urban school)

More individual time was given to learners who are struggling (Teacher J, female teacher with 23 years' experience: quintile 3 urban school)

Division of labour

Division of labour refers to who undertakes which role in the activity system. Power relations, encoded in roles, are, in classrooms, generally highly asymmetrical with the teacher exercising control over the learners and the learners generally following the rules set by the teacher. In collaborative pedagogy we see the greater use of group and peer work in introducing a new division of labour, where the learner becomes the teacher, leading to more symmetrical power relations. This is captured in the extracts below from two experienced teachers, one from a no-fee paying and one from a fee-paying school.

Extract 5: Division of labour shifts

Learners felt more part of their own learners' process and participated better. (Teacher K, gender undeclared, 19 years' experience: quintile 5 urban school)

Taught my learners to work independently and encouraged peer discussion. (Teacher L, female deputy principal, 30 years' experience: quintile 3 rural school)

Community

In CHAT, the community represents only those people who share a common object. In a collaborative pedagogical type, we see that the community expands to include not only the teacher and the learners, but also the parents. Research indicates that parental involvement in schoolwork is predictive of academic success, indicating that the increased community of the collaborative type of pedagogy could have a positive impact on attainment (Bhatti et. al, 2021; Bui & Rush, 2016).

Extract 6: A wider community

I'm using learner centred method, where I give learners the topic to be learned to discuss it first with their parents at home. (Teacher M, female teacher with 1 year experience: quintile 1 urban school)

The WhatsApp parent's group helped me to be in touch with my parents. I enjoyed sending my teaching videos to help the children grow and develop in their learning. (Teacher P, female teacher, 24 years' teaching experience: quintile 4 urban school)

The parents that helped at home made a huge positive impact, but learners with little support at home found it very difficult and they did not show improvement. (Teacher R, female teacher, 20 years' experience: quintile 3 urban school)

As we note from the response of Teacher R, an experienced teacher from a no-fee paying school, where parental involvement is lacking, learners are in danger of falling behind, especially in terms of language if the language of learning and teaching is English and they are not exposed to this at home.

Object

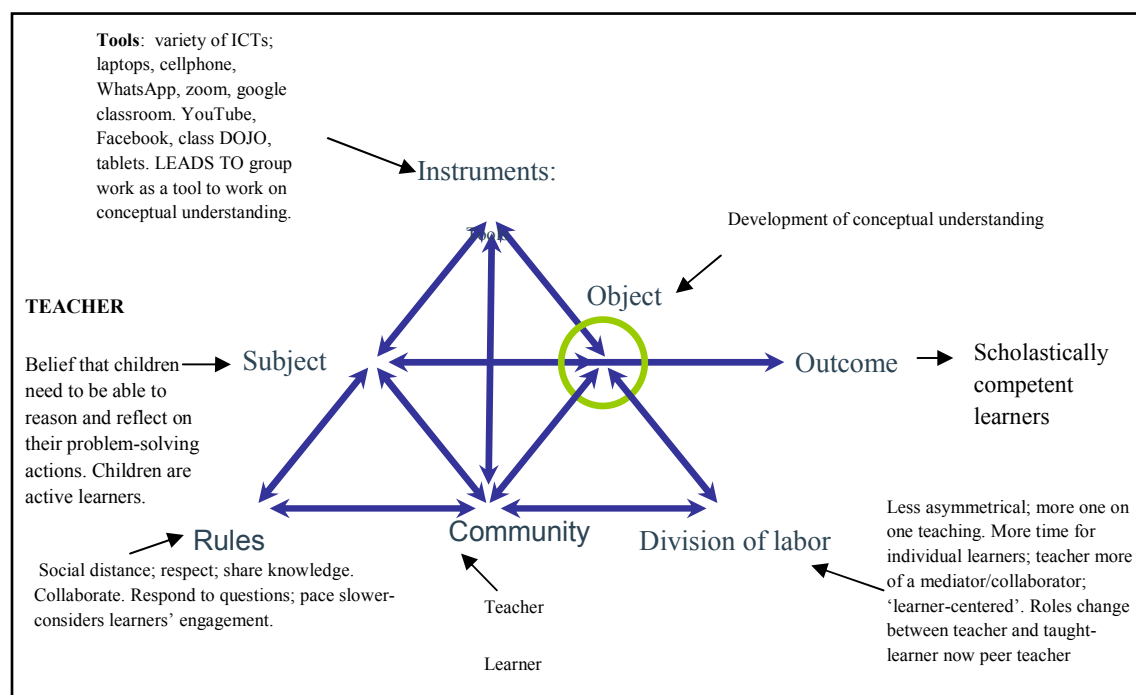
The object of the system is what motivates the activity. In a collaborative pedagogical mode, the object is perceived as developing learners' understanding. One way of achieving the object of understanding, was for the teachers to work interactively using technology. As can be seen below, the object of this pedagogical type was understanding.

Extract 7: motivated by the need to develop learners' understanding.

I also contextualize the topic, use real world examples to improve their understanding. (Teacher S, female teacher with 1 year experience: quintile 1 urban school)

In the extract above, the teacher indicates that using real-world examples enables the learner to develop a more coherent understanding of the abstraction taught in school. This is what Vygotsky referred to as the integration of the scientific and the everyday. Figure 6 below presents a graphic representation of collaborative pedagogy, where the teacher (subject) acts with technology (tools) to develop learners' understanding of concepts (object) in a context in which the division of labour sees a shift in the teacher and learner roles and a more symmetrical power relation between peer teachers.

Figure 6
Collaborative pedagogy



(Source: Hardman, 2008a, p. 245)

Figure 6 demonstrates the conceptualisation of collaborative pedagogy as located in an acquisition mode of pedagogy.

The second system

The second broad pedagogical type we identified in the data is a more traditional pedagogical mode that focuses on transmission of content rather than the development of concepts. Following Hardman (2008b, 2015) we refer to this pedagogical type as reinforcement pedagogy.

Subject

The subject of this activity system is the teacher who uses tools to act on the object of the activity system. In this pedagogical type, teachers use a traditional teacher-centred method of pedagogy that relies on the transmission of content rather than the development of concepts. A stated reason for this is the fact that teachers needed to cover the curriculum and had little time to spend developing understanding. What we have here, then, is a contradiction between curriculum coverage and conceptual understanding that we discuss in relation to the object below.

Extract 8: Teacher centred/passive learner?

Teacher centred method (Teacher AB, female teacher, 27 years' experience: quintile 1 school)

I emphasized repetition and drilling methods to solidate the acquired knowledge (Teacher AE, male principal, 37 years' experience: quintile 1 rural school)

Drilling method (Teacher AD, female deputy principal, 25 years' experience: quintile 3 urban school)

These extracts illustrate that the introduction of the novel technology led to a contradiction in the object of the lesson. Rather than being able to develop learners' understanding, the additional time needed for using technology led to a clash between the need to cover the curriculum on the one hand, and conceptual understanding on the other. What the teachers reiterate in the extracts above is that teachers used drilling and repetition as tools to reinforce content knowledge. The motivation here then is not to develop new conceptual understanding, but, rather, to consolidate what has already been learnt. This so-called reinforcement of content knowledge using drilling, repetition, and IRE patterns of discourse focused on known answer questions tends to characterise many traditional classrooms (Hardman, 2015).

Object

Faced with having to cover a set curriculum in a specified time, teachers in this pedagogical mode were motivated to cover the curriculum at the expense of developing conceptual understanding. This is very clearly articulated in teacher AI's claim (below) that she needed to cover the syllabus, rather than adopt novel pedagogical methods. There is a clear contradiction here, then, between the need to cover the curriculum and the desire to develop learners cognitively. Faced with this contradiction, teachers from both no-fee and fee-paying schools revert to old, traditional modes of teaching as highlighted in the extracts discussed in the subject section above. We are left with a picture of teachers having to leave out certain concepts in a bid to cover the curriculum in the specified time.

Extract 9: Contradictions in the object

Due to the lot of work and pressure I couldn't come up with different strategies because the aim was to make sure that I cover the syllabus (Teacher AI, female, 7 years' teaching experience: quintile 1 rural school)

Worked out methods to cover more content in a shorter space of time (Teacher AK, gender undeclared, 25 years' experience: quintile 5 urban school)

As we can see from teacher AK, less time led to an increase in the pace at which work was covered, leading them to set the lesson pace, unlike in the collaborative mode where learners could have some control over the pace of their learning. A tightening of this rule, then, in the activity system leads to the subject becoming more didactic and transmitting knowledge, rather than allowing for the co-constructing of meaning.

Tools

Tools can alter the object of the activity system, depending on what they are and how they are used. In reinforcement pedagogy teachers did not use novel technology such as ICTs but, rather, reverted to workbooks and printouts. Where they tried to use technology, this failed as evidenced by the following.

Extract 10: Contextual factors at play in the activity system

I tried to form a WhatsApp group with my classes where I would send videos explaining certain concepts or topics, give them a classwork and we would mark it in order for them to make corrections, but this did not work as they struggled to get data from their parents and those who were fortunate to get it, network would be a problem (Teacher AL, female teacher 24years' experience: quintile 3 rural school)

Yes, I tried online teaching using WhatsApp due to lack of gadgets among learners it was difficult to give learners work while they are at home. (Teacher AT, female teacher, 30 years' experience: quintile 5 rural school)

There is a real need to consider the context of technology when discussing whether technology can have an impact on pedagogy. While teachers may have wanted to use novel technology, they were unable to do so because of connectivity issues or the lack of data or devices for learners to use. When considering pedagogical change in South Africa, one needs to take cognisance of context. Where access to technology is not guaranteed, regardless of a teacher's particular belief about learning, the teacher is forced to use what is available to teach.

Rules

In the instance of reinforcement pedagogy, the community consisted of the learners and the teacher. In this type of pedagogy, pacing becomes very tightly controlled by the teacher to accomplish the object of curriculum coverage. Where the teacher exercises more control over pace in a classroom, there is less likelihood of learners being able to work independently and this impacts on the division of labour in the class as the teacher becomes the transmitter of knowledge and the learners become the recipients of this content, whether they understand it or not.

Extract 11: Tightening of pacing and constricting of object

The rush was to get the work completed. Time was limited. (Teacher AN, female teacher 29 years' experience: quintile 3 urban school)

Had to leave out certain concepts due to time constraints (Teacher AJ, female teacher, 34 years' experience: quintile 5 urban school)

Community

Of interest in this type of pedagogy was the fact that teachers tried to get parents involved in sharing the object of the activity, but ultimately failed to obtain their input. Reasons for parental lack of involvement range from a lack of devices to what at least one teacher, AQ, stated is a lack of desire to assist learners at home. There is an emerging contradiction here between the need for parental involvement and the lack of devices to facilitate this (or, in one case, the desire to do so). When we speak of reinforcement pedagogy in this paper, we need to bear in mind the constraints teachers faced in relation to the use of ICTs in a socio-cultural context where devices are simply not available.

Extract 12: Community

Tried to teach online but most parents did not have smart phones and those who had complained about not having data (Teacher AO, female teacher, 5 years' experience: quintile 5 urban school)

The community that we are serving are not serious about their children's education. When giving them work to do at home most of them are not assisting their kids with their schoolwork. Others instead of helping they write for them. So, this method was not working at my school. And also, the thing of online learning was not working since they don't have access for smart phones and laptops (Teacher AQ. Female teacher with 13 years' experience: quintile 1 rural school)

Division of labour

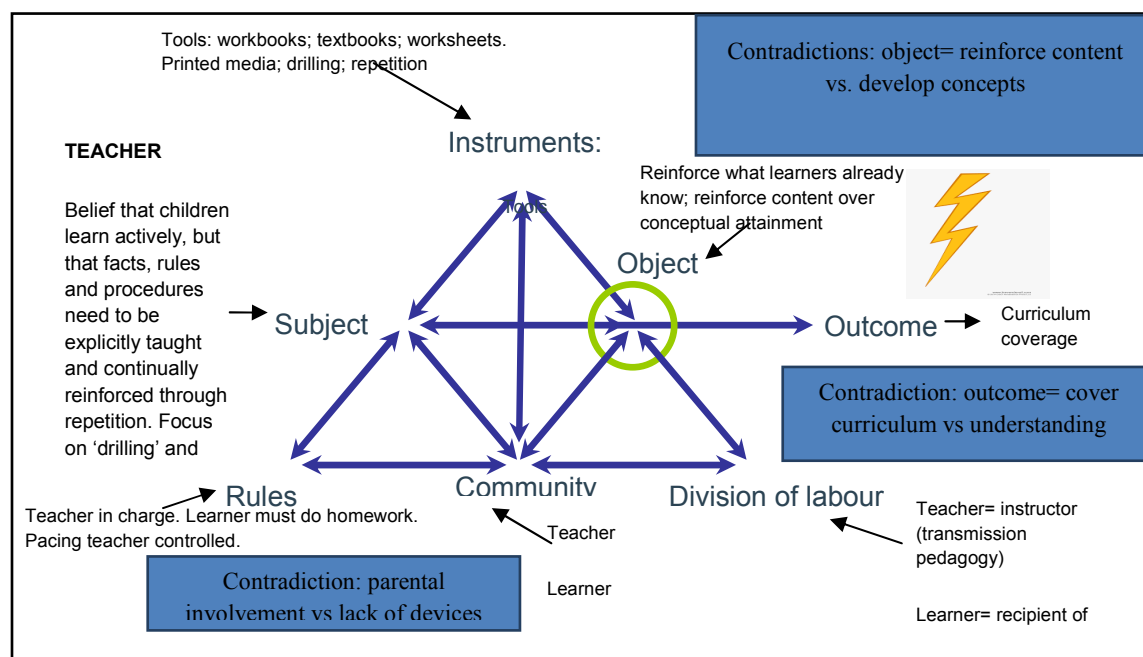
Tightening of pacing coupled with the teachers' beliefs that pedagogy aims to transmit knowledge leads to a view of division of labour in reinforcement pedagogy that sees the teacher as instructor and the learner as passive recipient of content, with a focus on rote learning strategies. We are not arguing here that rote learning is not a useful pedagogical method; it certainly can have its uses, depending on what the object of the teaching is. If one's motivation is to reinforce knowledge, then rote learning is very useful. However, if one's motive is aimed at conceptual acquisition, rote learning cannot achieve this.

Extract 13: Teacher as instructor, learner as recipient of knowledge.

Only whole class teaching method was possible but difficult, because I was not even able to visualize if the learners are attentive or not. (Teacher AT female HOD, 31 years' experience: quintile 3 rural school)

Unlike in collaborative pedagogy where learners were able to peer teach and even work independently, division of labour here has the teacher as the sole knower teaching to the entire class as a homogenous group. Teacher AT even indicated that she did not know whether her learners were paying attention or not. There is no learner input here and pacing is extremely tightly controlled by asymmetrical power relations between teacher and taught. In figure 4 we provide a graphic illustration of reinforcement pedagogy.

Figure 7
Reinforcement Pedagogy



(Source: Hardman, 2008b, p. 254)

Here we see a form of pedagogy in which the subject (teacher) believes that learners are active learners and yet adopts a teacher-centred, transmission mode of pedagogy to reinforce content knowledge and cover the curriculum (object). Repetition and drilling become the tools with which to achieve curriculum coverage at the expense of developing conceptual understanding. There is a fundamental contradiction in the object of this system—conceptual understanding versus curriculum coverage. Faced with a content heavy curriculum, teachers revert to using methods with which they are familiar, such as drilling and tightening the pace of the lesson. Reinforcement pedagogy echoes transmission modes of pedagogy with the teacher as the expert knower controlling the lesson through tight pacing and using drilling as a tool to reinforce content. There is nothing inherently problematic about reinforcement pedagogy; there is a place for reinforcing content knowledge and developing memory tracts. However, this kind of pedagogy cannot *develop* a child cognitively. To do this, one must move beyond the known to the unknown, mediating novel cognitive structures in problem-solving by providing the learner with knowledge that is currently beyond their capacity to solve independently (Vygotsky, 1962/1986). However, there is a real challenge in a collaborative mode of pedagogy in that it requires the teacher to relinquish control over the knowledge constructed in classrooms. This is not to say that knowledge is constructed de novo, and that any construction of knowledge is useful. We understand that different types of knowledge have different epistemic weights (Muller, 2014) and knowledge is fixed, for a time, in a discipline of knowers. However, we are suggesting that knowledge needs to be co-constructed if it is to be meaningfully acquired by learners. In this paper, we have suggested that collaborative pedagogy can achieve this, having found evidence of such an approach across both no-fee and fee-paying schools.

Conclusion

In this paper we address the question of how technology changed pedagogical practices in relation to the COVID pandemic's consequent lockdown. Teachers' perceptions of pedagogical change (n=1089) formed the basis of our data that was gathered using a survey with open and closed question. Cultural Historical Activity Theory (CHAT) provides us with both an analytical perspective from which to describe pedagogical change across various nodes of an activity system, as well as a theoretical basis to understand tool use as developmental. In this study we identified two broad pedagogical types—reinforcement and collaborative pedagogy. While reinforcement pedagogy is motivated by curriculum coverage through a transmission mode of teaching, collaborative pedagogy is motivated by the need to develop learners conceptually. We argue that an acquisition type pedagogy, evident in collaborative pedagogy, is required for learning and understanding concepts and, ultimately, for cognitive development. However, pedagogy is fluid; both reinforcement and collaborative pedagogy are necessary for schooling. Reinforcement pedagogy enables learners to consolidate the content they have learnt while collaborative pedagogy enables them to go beyond the content to understand the concepts underpinning this. Further, our findings indicate that context plays a determining role in pedagogical practices. The findings revealed evidence of both pedagogical types in both fee-paying and no fee-paying schools. This finding is interesting since it contradicts popular beliefs that fee-paying schools that are highly resourced have access to significantly better facilities, including technology, are generally staffed by more qualified teachers, and provide better quality teaching in comparison to no-fee schools. This finding reiterates research indicating that the quality of education provided in schools not only depends on the quality of teachers but also on the quality of teaching (Naylor & Sayed, 2014). Further, in-depth qualitative research is required to see whether what we have found in open-ended survey questions is what actually happens in homes and/or classrooms. While the findings indicate that ICTs altered pedagogy in terms of our respondents' perceptions, limited information is available on whether this happened in homes. We also acknowledge that no two classrooms are the same, and understanding how context impacts on pedagogy is perhaps more important in the post-COVID era than it was before. The digital divide between those who have access to devices and connectivity and those who do not will directly affect cognitive development in our context. This is a key challenge that needs to be appropriately addressed if the primary goal of providing quality education for all is to be achieved in South African schools.

References

- Bhatti, M. S., Asif, I, Shaista, N, Rafia, M, & Javed, Z. (2021). Investigating the role of ICT for teaching English at elementary level. *AsiaCALL Online Journal*, 12(2), 87–93. ISSN 1936-9859. <https://asiacall.info/acoj>

- Bui, K., & Rush, R. A. (2016). Parental involvement in middle school predicting college attendance for first-generation learners. *Education, 136*(4), 473–489.
<https://web.p.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=3e16b8ae-6ffa-4025-8558-f1933a9d3f63%40redis>
- Cazden, C. B., & Beck, S. W. (2003). Classroom discourse. In A. C. Graesser, M. A. Gernsbacher & S. R. Goldman (Eds.), *Handbook of discourse processes* (pp. 165–197). Lawrence Erlbaum Associates Publishers.
- Daniels, H. (2001). *Vygotsky and Pedagogy*. Routledge.
<https://doi.org/10.4324/9780203469576>
- Department of Basic Education, (2020a). *School recovery plan in response to COVID-19*.
<https://www.education.gov.za/Portals/0/Documents/Recovery%20plan%20page/Links%20for%20schools/school-recovery-plan-june-2020-1.pdf?ver=2020-06-15-091102-260>
- Department of Basic Education, (2020b). *Teacher Guidelines for Implementing Revised Annual Teaching Plans (ATPs) TEACHER VERSION*.
<https://kfmulaudzi.files.wordpress.com/2020/07/teacher-guidelines-for-the-implementation-of-the-revised-atps-6-july.pdf>
- Engeström, Y. (1987), *Learning by expanding: An activity theoretical approach to developmental research*. Orienta-Konsultit.
- Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*, 133–156.
<https://doi.org/10.1080/13639080020028747>
- Hardman, J. (2007). Making sense of the meaning maker: Tracking the object of activity in a mathematics classroom using Activity Theory. *International Journal of Education and Development using ICT, 3*(4), 110–130. <http://ijedict.dec.uwi.edu/viewissue.php> ISSN 1814-0556
- Hardman, J. (2008a). New technology, new pedagogy? An activity theory analysis of teaching with computers. [Doctoral dissertation, University of Cape Town].
- Hardman, J. (2008b). Researching pedagogy: An activity theory approach. *Journal of Education, 45*, 63–93. ISSN 0256-0100
- Hardman, J. (2015). Pedagogical variation with computers in mathematics classrooms: A Cultural Historical Activity Theory analysis. *PINS 48*, 47–76. ISSN 2309-8708
- Hardman, J. (2021). Towards a pedagogical model for teaching through rather than merely with technology: A cultural historical approach. *South African Journal of Higher Education, 35*(4), 104–115. <https://dx.doi.org/10.20853/35-4-4222>

- Hardman, J. (2023). *A Cultural-Historical approach towards pedagogical transitions: Transitions in post-apartheid South Africa*. Bloomsbury
- Hoadley, U. (2017). *Pedagogy in poverty: Lessons from twenty years of curriculum reform in South Africa*. Routledge.
- Ibáñez, M. B., & Delgado-Kloos, C. (2018). Augmented reality for STEM learning: A systematic review. *Computers & Education, 123*, 109–123. <https://doi.org/10.1016/j.compedu.2018.05.002>
- Kanjee, A., & Bhana, J. (2022). *Activating formative assessment: Transforming pedagogy to improve learning for ALL*. Oxford University Press.
- Kanjee, A., & Ramollo, J. K. (2023). Exploring the impact of the COVID-19 school reform plan on teachers' assessment practices. *Assessment in Education: Principles, Policy & Practice, 30*(3/4), 1–28. <https://doi.org/10.1080/0969594X.2023.2228503>
- Knight, S., & Mercer, N. (2015). The role of exploratory talk in classroom search engine tasks. *Technology, Pedagogy and Education, 24*(3), 303–319. <https://doi.org/10.1080/1475939X.2014.931884>
- Leontiev, A. N. (1981). *Problems of the development of the mind*. Progress.
- Mukuna, K. R., & Aloka, P. J. (2020). Exploring educators' challenges of online learning in COVID-19 at a rural school, South Africa. *International Journal of Learning, Teaching and Educational Research, 19*(10), 134–149. <https://doi.org/10.26803/ijlter.19.10.8>
- Muller, J. (2014). Every picture tells a story: Epistemological access and knowledge. *Education as Change, 18*(2), 255–269. <https://doi.org/10.1080/16823206.2014>
- Mutton, T. (2020). Teacher education and Covid-19: Responses and opportunities for new pedagogical initiatives, *Journal of Education for Teaching, 46*(4), 439–441, <https://doi.org/10.1080/02607476.2020.1805189>
- Naylor, R., & Sayed, Y. (2014). *Teacher quality: Evidence review*. Office of Development Effectiveness: Commonwealth of Australia.
- Piaget J. (1976). Piaget's theory. In B. Inhelder, H. H. Chipman & C. Zwingmann (Eds.), *Piaget and his school* (pp. 9–17). Springer Study Edition. https://doi.org/10.1007/978-3-642-46323-5_2
- Ramrathan, L. (2021). School curriculum in South Africa in the Covid-19 context: An opportunity for education for relevance. *Prospects, 51*(1/3), 383–392. <https://doi.org/10.1007/s11125-020-09490-1>

- Sayed, Y., & Motala, S. (2012). Equity and 'no fee' schools in South Africa: Challenges and prospects. *Social Policy & Administration*, 46(6), 672–687. <https://doi.org/10.1111/j.1467-9515.2012.00862.x>
- Sayed, Y., & Sing, M. (2020). Evidence and education policy making in South Africa during Covid-19: Promises, researchers and policymakers in an age of unpredictability. *Southern African Review of Education with Education with Production*, 26(1), 20–39. <https://doi/pdf/10.10520/ejc-sare-v26-n1-a3>
- Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, 27(2), 4–13. <https://doi.org/10.3102/0013189X027002004>
- Sinclair J., & Coulthard, M. (1975) *Toward an analysis of discourse: The English used by teachers and pupils*. Oxford University Press.
- Soudien, C. (2020). Systemic shock: How Covid-19 exposes our learning challenges in education. *Southern African Review of Education with Education with Production*, 26(1), 6–19. <http://hdl.handle.net/20.500.11910/15377>
- United Nations Educational, Scientific and Cultural Organization (2020). *Supporting teachers in back-to-school efforts: Guidance for policymakers*. International Task Force on Teachers for Education 2030. https://teachertaskforce.org/sites/default/files/2020-09/Supporting%20teachers%20in%20back%20to%20school%20efforts_second%20edition.pdf
- Vale, P., & Graven, M. (2023). Strategies implemented by South African teachers to ensure continuing mathematics education during COVID-19. *ZDM–Mathematics Education*, 55(1), 163–176. <https://doi.org/10.1007/s11858-022-01408-9>
- Vygotsky, L. S. (1978). *Mind in society. The development of higher psychological processes*. (Trans. M. Cole, V. John-Steiner, S. Scribner & E. Souberman). Harvard University Press.
- Vygotsky, L. S. (1986). *Thought and language*. (Trans. E. Hanfmann & G. Vakar). MIT Press. (Original work published 1934)