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Preparing Pre-service Teachers to Teach Reading Strategies within a Mixed Reality Simulation Environment

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Abstract

As a language teacher, teacher educator and researcher, to me the name Rebecca Oxford has always been synonymous with language learning strategies across the world and specifically the theme of its teachability. Rebecca has always stated that the language teacher's role includes strategy instruction even if it achieves only partial success. Research has focused almost exclusively on how reading comprehension strategies, the focus of this study, can be taught to learners, but the preparedness of pre-service teachers to teach reading strategies has seldom been the focus within initial teacher education programs. The purpose of this study was to determine participants' perceptions of teaching within a mixed reality simulation environment with a specific focus on the explicit instruction of reading comprehension strategies. A case study approach was utilized, and ten second-year pre-service teachers enrolled for the Bachelor of Education (B.Ed) degree as well as one mentor teacher and one teacher educator were purposefully selected to participate in the study. The results indicated that the themes corresponded with the activities during the different stages of a mixed reality simulation action review cycle and included show and tell, collaborative brainstorming, deconstruction of the core teaching practice, anxiety and disbelief, pause and redo, coaching and feedback and focused reflection.

Keywords: *Rebecca Oxford, Reading Strategies, Mixed Reality Simulation, Pre-service Teachers, Preparedness, Reading Comprehension, Explicit Instruction, Mentor, Teacher Educator*

¹Introduction

Rebecca Oxford's razor-sharp mind and her mentoring during my PhD study have had a great impact on how I approach my research. She always told me to "push the boundaries" and to be

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“innovative”. In this study, I aim to do both these things by addressing one of the areas attracting debate around the concept of language learning strategies, namely its teachability.

In the present study the purpose was to determine pre-service teachers’, a mentor teacher’s and a teacher educator’s perceptions of explicitly teaching reading strategies within a mixed reality simulation environment. The study aimed to explore the perceptions of pre-service teachers regarding their teaching and specifically the instruction of reading strategies within a mixed reality simulation environment.

Explicit Instruction of Reading Strategies

In most of the developing world, learners are attending school without adequately learning to read (United Nations Educational, Scientific and Cultural Organization, 2014). In South Africa, new research suggests that the percentage of Grade 4s who cannot read for meaning has risen from 78% in 2016 to 82% in 2021 as a result of the pandemic (Spaull, 2023). According to Spaull (2022, p. 1), “South Africa is not on track to ensure that all children can read by 2030”. He continues to state that if South Africa remains on the current trajectory of improvement “we will reach 95% of Grade 4s reading for meaning in 80 years”.

Preparing pre-service teachers for the multi-faceted role of becoming a classroom teacher capable of teaching reading well is complex and challenging (Nel, 2022). Presently, not only are far too few teachers proficient in scientifically based reading instruction, but far too many programs that prepare the country’s teachers are failing to give them the grounding they need in order to become proficient (Spaull, 2022; Taylor, 2021). There is great potential to accelerate the learning of learners by improving the quality of teaching but changing teaching practices presents a significant challenge. In the stories told in the Oxford et al. (2014) article, Gunning and Nel indicate that learners as well as pre-service teachers had experienced very little strategy instruction and were unaware of what language learning strategies entailed. In addition, Oxford et al. (2014, p. 46) state that “For teachers to provide assistance to learners, they themselves require complete information about what learning strategies are, what makes learning strategies effective for given tasks, and how to deliver strategy instruction”.

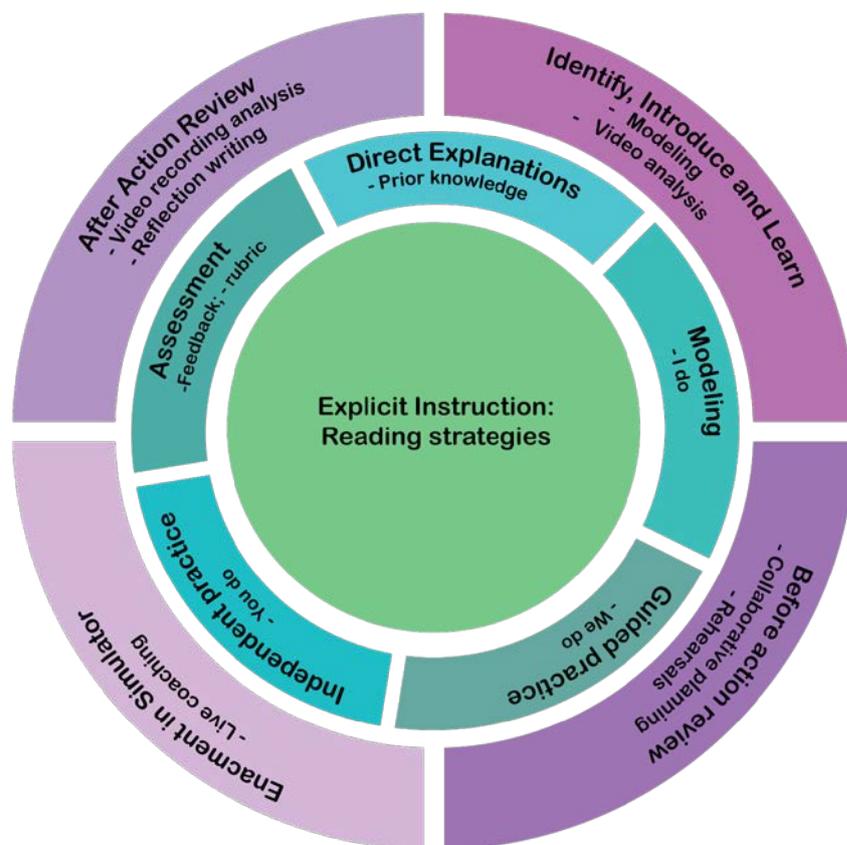
Over the last decades, research on reading strategy instruction has given considerable attention to how strategies are taught in various language learning contexts (Brown, 2017; Pearson & Cervetti, 2017; Brevik, 2015), but little attention has been given to how pre-service teachers are prepared to teach reading strategies (Jakobson et al., 2022). Oxford (2017, p. 273) states that, in order to teach reading effectively “it is crucial to teach reading strategies”, and “successful strategy instruction requires competence on the part of the language teacher” (Oxford et al., 2014, p. 44). Teachers tend to neglect reading strategy instruction (Klapwijk, 2015), they lack knowledge about reading and reading instruction (Barron et al., 2018). Furthermore, although reading comprehension is acknowledged as a “challenging task” (Mirfatemi et al., 2020, p.19) in both the first and subsequent languages, reading comprehension strategies are not widely known among teachers (Oxford et al., 2014; Sampson et al., 2013). Brevik (2015) notes that even though teachers may have possessed knowledge, they were not explicitly aware of their instruction of reading strategies. According to Oxford (2017, p. 272), second language reading strategies “are teachable, dynamic thoughts and behaviors that learners consciously select and employ in specific contexts to improve their self-

regulated, autonomous L2 reading development for effective task performance and long-term proficiency”.

In Chamot’s story, she stated that strategy instruction should be carried out by teachers rather than researchers if it is to be really effective. She also stated that successful teachers “model their own use of particular learning strategies (Oxford et al., 2014, p. 35). Jacobson et al. (2022, p. 2232) state that “Effective programs for teaching RC strategies most often involve direct and explicit reading strategy instruction and incorporate techniques of metacognitive modelling, collaborative use of the strategy in action, guided practice, and independent use of the strategy so students can reach their fullest potential”. In Chamot’s story she also emphasized that explicit strategy instruction yields greater effectiveness compared to implicit instruction integrated into classroom activities lacking explanations and modeling. Various models of strategy instruction have been developed (Oxford, 1990; 2017) and seem to highlight the importance of explicit instruction which takes cognizance of learners’ needs and interests, cultural background and the importance of modeling and explanation.

Explicit instruction is a well-structured and systematic core teaching practice that is used for teaching academic skills (Archer & Hughes, 2011). This method is referred to as “explicit” because it is clear, straightforward, and direct in both its instructional design and delivery procedures. The hallmark of explicit instruction is a sequence of scaffolds or supports that lead learners through the learning process. These supports include clear statements about the objectives and reasons for learning a new skill or strategy, precise explanations and demonstrations, and supervised practice with feedback until learners can master the skill or strategy independently (Archer, 2020). Vaughn and Fletcher (2021, p. 5) state that “The science of reading has established that explicit instruction is associated with beneficial outcomes for students and may be the secret sauce of instructional success”. The stages of explicit instruction include direct explanation, modeling or think alouds, guided practice, independent practice and assessment or closure (cf. Figure 1).

Explicit instruction does not have to be scripted or prescriptive, as long as the instruction is systematic, and learners receive support focused on their individual needs. In this study, I followed the same principles of explicit instruction with the pre-service teachers to make the learning and teaching of explicit instruction of reading strategies more accessible to the students, increase their confidence in teaching, and hopefully ensure that a wider range of learners benefit from this type of instruction if the pre-service teachers are capable of teaching this core practice effectively.

Figure 1*Explicit Instruction of Reading Practices Within an ARC***Mixed Reality Simulation and Pre-service Teacher Preparation**

A major contributor to teacher quality and their teaching effectiveness is the strength of their preparation (Carver-Thomas & Darling-Hammond, 2017). However, the amount and quality of practice provided to pre-service teachers during initial teacher education varies greatly (Deacon, 2016). With reference to the ITERP study, Taylor and Mawoyo (2022, p. 168) state that “at all except one institution, teaching practice takes place mostly in suburban schools, most supervisors are not subject specialists; and in at least two institutions it is possible for students to pass teaching practice despite performing poorly in a classroom, or even without being assessed on their classroom expertise at all”. Initial teacher education programs, therefore, often have little control over the quality and reliability of the experiences afforded to pre-service teachers during their school-based placement (Shaughnessy & Boerst, 2018). Thus, ensuring all pre-service teachers have equitable opportunities for specific core reading skills practice during school-based placement is difficult. Mixed reality simulations serving as approximations of practice can provide solutions to these challenges (Dieker et al., 2015; Shaughnessy & Boerst, 2018). According to Benedict et al. (2016, p. 2), “Practice-based opportunities that are coherent, sequenced, and scaffolded can help student teachers automatize their knowledge and skill for teaching prior to entering complex classroom settings”. Practice-based opportunities that ensure structure and progression allow student teachers to develop skill fluency and decision-making abilities prior to entering school-based environments where

mistakes can be costly (Benedict et al., 2016; Dieker et al., 2017). Bridging the gap between actual and desired instruction (e.g., explicit instruction of reading strategies) will not be achieved by practice as usual; innovative practices, perhaps involving the use of technology (e.g. Altınbaş, 2023; Richards, 2015) are required.

Mixed reality simulations are a technological approach that teacher educators can use to give pre-service teachers deliberate practice teaching in virtual, or more controlled, environments before they begin to teach learners in the classroom (Dawson & Lignugaris-Kraft, 2017). Ade-Ojo et al. (2022, p. 862) define simulation “as an approach to teaching that utilizes the process of creating a replica of real-life situations in order to develop students’ response to such a situation if and when confronted with it in their actual practice”. TeachLivE™ is a mixed reality simulation platform designed to provide teachers with realistic, immersive training experiences. It gives pre-service teachers an opportunity to practice short lessons or part of a lesson by interacting with five avatars (i.e., Kevin, Sean, Maria, CJ, and Ed) (cf. Figure 2).

Figure 2

TeachLivE™ Avatars



Source: <https://sites.google.com/view/teachlive/home>

Each of the avatars have their own personalities (Dieker et al., 2015). Pre-service teachers can see the avatars on a screen in front of them. Mixed reality simulations use “digital puppetry” in the form of avatar learners in a virtual classroom controlled by a live interactor who operates the technology behind the scenes to control the avatar learners’ behaviors (Bautista & Boone, 2015). The mixed-reality environment within TeachLivE™ allows pre-service teachers to learn without placing “real” learners at risk through engaging in virtual rehearsals of a targeted core teaching practice (e.g., explicit instruction of reading strategies). Dieker et al. (2017, p. 64) state that “Time in a simulator is compressed so that 10 minutes equates to between 30 and 60 minutes of real time”.

Certain attributes inherent to the functionality of mixed reality simulations lend themselves to targeted skills practice for pre-service teachers. Dieker et al. (2014) particularly emphasize TeachLivE’s™ pause and restart functions. As opposed to the live classroom, in a mixed reality classroom a teacher educator can at any time pause a scenario to provide coaching to a pre-

service teacher or even restart the scenario if the student teacher is experiencing difficulty. These functions allow a candidate the opportunity for repeated skills practice until he or she achieves mastery. Learning is done via an action review cycle (ARC) (Nel et al., 2020) (cf. Figure 1). The action review cycle starts with the teacher educator, and in the case of this study the mentor teacher was included, determining what core teaching practice or task (e.g., explicit instruction of reading strategies) they want the pre-service teachers to perform. During this identify, introduce and learn stage the teacher educator and mentor teacher can model the practice in the mixed reality simulated environment or they can show the students a video in which the practice is presented and this can be discussed. During the before action review (BAR), the aim is to determine what the pre-service teachers already know about the practice and how to implement it. The focus is on what the intended results are and what this will look like as well as identifying potential challenges that might occur (NHS Improving Quality, 2015). Pre-service teachers can also co-plan with the mentor teacher and the teacher educator and also rehearse during this stage. During the enactment stage, the pre-service teachers teach the lesson segment while receiving feedback and coaching. The after-action review (AAR) stage takes place immediately after the teaching session in the mixed reality simulated environment. The aim of this stage is to reflect on what happened that you want to learn from by creating a common understanding of the teaching under review, by reflecting on successes and failures, and by identifying specific recommendations (NHS England and NHS Improvement, 2021).

Method

The study was guided by the following research question:

RQ: How did the pre-service teachers, mentor teacher and teacher educator perceive the explicit teaching and learning of reading strategies, utilizing an action review cycle, within a mixed reality environment?

Design

A single exploratory case study design was used for this study. The case study enabled the exploration of a specific and well-defined case, through a thorough and detailed collection of data from multiple sources, to provide a rich and contextual understanding (Creswell, 1998). By retaining the holistic and meaningful characteristics of real-life events, case studies are particularly useful when seeking to answer how or why questions (Yin, 2009). Creswell (2002, p. 485) recommends a case study if the problem to be studied “relates to developing an in-depth exploration of a bounded system (e.g., an activity, event, process, or individuals) based on extensive data collection”. The bounded case in this study was the pre-service teachers, a mentor teacher and a teacher educator teaching within a mixed reality simulation environment. According to Zeichner (1999), case studies are particularly valuable in teacher education programs as they provide an in-depth perspective on the activities and experiences of pre-service teachers, mentor teachers and teacher educators.

Sample

This qualitative case study initially involved 10 second-year B.Ed pre-service teachers (i.e., six students studying via contact mode, and placed in the same partnership school for their school-

based teaching practicum, and four students studying via distance mode and placed in various provinces across the country). The pre-service teachers (PSTs) were all specializing in an English language module as part of their B.Ed, either as their Home Language or as a First Additional Language. The mentor teacher, a language teacher, was purposefully selected as she was trained as a mentor teacher by the local teaching district, and she mentors pre-service teachers when they complete their school-based teaching practicum. The teacher educator, an early adopter of mixed reality simulation in her reading modules, and who is responsible for the academic component of the teaching practicum modules within the B.Ed programme, participated in the study.

Data Collecting Methods and Procedure

The following data collection methods were used in this study: mixed reality simulation classroom observations and field notes and video-stimulated reflections of lessons recorded while presented in the mixed reality simulator. According to Merriam and Tisdell (2016, p. 137), observations require the researcher to record the behavior that happens in an environment where “the phenomenon of interest naturally occurs”. According to Gass and Mackey (2000, p. 17), stimulated recall includes “an information processing approach whereby the use and access to memory structures is enhanced, if not guaranteed, by a prompt that aids the recall of information”. The pre-service teachers were asked to watch the recorded video of their teaching in the mixed reality simulated environment and to remind them about the specific moments, in order for the researcher to understand some of the decisions made by the pre-service teachers while they also “verbalise the thoughts and reactions they experienced” (Assiri, 2016, p.106). Borg (2006) observes that video stimulated reflections are used to initiate and facilitate discussion about teachers’ actions and rationales while delivering instruction at particular points in the mixed reality classroom.

Each mixed reality simulation session was held online through Zoom and lasted 20 minutes with 10 minutes of active teaching and 10 minutes of after-action review. A total of four sessions was held with each student based on needs identified by the pre-service teachers themselves, the mentor teacher and the teacher educator. Three sessions were individual where only the pre-service teacher, the mentor teacher and teacher educator were present, and the last session was collaborative and peers were allowed to join. The distance students logged in from home and the campus students completed their sessions in the mixed reality simulation classroom on campus.

Data Analysis

Thematic analysis was used to analyze the data. Kiger and Varpio (2020, p. 2) define thematic analysis as a qualitative data analysis method that involves scouring through a dataset to identify, scrutinize, and describe recurring patterns. This approach is a suitable and effective method to employ when attempting to comprehend a collection of experiences, ideas or behaviors within a dataset (Braun & Clarke, 2006). I employed Braun and Clarke’s (2006) six-step method, which includes becoming familiar with the data, creating initial codes, searching for themes, reviewing and refining themes, defining and naming themes, and finally presenting the findings in a report.

Within qualitative research care must be taken to address the potential bias of the researcher. Two methods were used to ensure that this did not happen, namely member checks and peer review. Guba and Lincoln (1989) described member checking as systematically soliciting feedback about data and conclusions from the people who are subjects of research. In this study, all participants checked the accuracy of the data transcriptions and clarified any ambiguities. Maxwell (1996, p. 94) states that member checking “is the single most important way of ruling out the possibility of misinterpretation of the meaning of what they say and perspective they have on what is going on”. One teacher educator, who also implements mixed reality simulations in her Afrikaans language module, acted as peer reviewer of the data as well as the analysis. Her external review and input helped to identify any validity threats and raise awareness of the participating teacher educator’s biases and assumptions.

Ethical Considerations

Before commencing the study, ethical clearance was obtained from the NWU-EMELTEN-Rec, and permission was also obtained from the university gatekeeper and the North West Department of Education and Training. All participants were informed about the purpose of the research, that their participation was voluntary and that they could withdraw at any time without providing reasons. Before participating in the study, all participants signed consent forms that are kept on the principal investigator’s password protected computer.

Results

The themes emanating from the data coincided with the focal points/stages of the mixed reality simulation action review cycle. The themes are presented under each of the stages of the action review cycle.

Identify, Introduce and Learn

The common theme that was highlighted during this stage was “show and tell”. The pre-service teachers indicated that hearing about explicit instruction and reading comprehension strategies in the class (i.e., lecture) was not the same as seeing it in action. All students were of the opinion that the direct explanation of what explicit instruction of reading comprehension strategies entails accompanied by the modeling and video analysis of the practice was “eye opening”. Some comments included:

Hearing about how to teach strategies is not the same as actually seeing how it should be done.

I completely misunderstood previous explanations in our classes. This is what ‘show and tell’ is all about.

One of the distance students commented that:

This is the first time that I have seen the lecturer explain and actually show us how to put the ‘content’ into practice.

The mentor teacher commented that:

I actually realized that I hardly ever show the learners what I want them to do. I assume that they understand my explanations or directions.

As teacher educator I wanted to practice what I was preaching and also try to link theory to practice. In addition to showing and modeling the practice, I also gave the students research articles on the explicit instruction of reading comprehension strategies.

Before Action Review

The first theme that was identified during this stage was “collaborative brainstorming”. The pre-service teachers indicated that working together with both a mentor teacher (MT) and a teacher educator (TE) was something that they had never experienced before. Some comments included:

I learnt such a lot from working together with the MT and TE. We usually only get instructions on what to do and when never get their input on something that we have to go and teach

We got to brainstorm together and got insight to what they were thinking and important things we have to consider that we also regarded as being a cut-and-paste activity (i.e., planning lessons and just haphazardly thinking about what learners should know, etc.)

This was very intense; we considered learners’ need when deciding on the reading comprehension strategies, what we wanted to achieve with the lesson, what challenges we thought we would face. It was really intimidating, and I realized that before we were only play preparing.

The mentor teacher commented that she was never privy to what teacher educators actually wanted the pre-service teachers to do or think about when they taught during the teaching practicum. As teacher educator I realized that we assume that pre-service teachers will think of the crucial aspects to consider when preparing for their teaching; we tend to leave a lot to chance and then criticize without giving them the tools to perform well.

The second theme that was highlighted during this stage was the “analysis or deconstruction of the core teaching practice – explicit teaching of reading comprehension strategies”. Comments from the pre-service teachers included that:

I did not know that we could actually explicit teaching apart and look at the various components or even that this is the way to put in into practice

Being able to look at how we explain or model the reading comprehension strategies to the learners, then focus on doing it with them, followed by allowing them to do it on their own, and finally to check to make sure that they understood was so enlightening.

We really took this apart

For the first time I get it; I know what is meant by preparing and how to systematically and explicitly teach strategies.

The mentor teacher mentioned that:

I now know why my learners are still confused at the end of a lesson; I don't support them enough by working with them. I tell and then they must do.

As teacher educator I realized just how complex quality teaching can be and that as teacher educators we have not been providing our students with the quality preparation that they need; we have underestimated just how complex teaching a core teaching practice can be. There are so many on-the-fly decisions that need to be made that you get side-tracked and lose sight of the impact that you have on the learners' learning.

Enactment in the Mixed Reality Simulation Environment

The first theme that relates to this stage is "anxiety and disbelief". The pre-service teachers all mentioned that they were very anxious during the first session and they also couldn't believe that the avatar learners were so real. The students mentioned that:

It was nerve-wrecking; 10 minutes was a very long period of time.

I couldn't believe that the avatars were responding to my teaching in the way they did.

They respond just like real learners; this is far better than our micro-teaching sessions where our peers try to be like learners, but it is so fake and I am never nervous

The mentor teacher mentioned that:

This is so real; I have a Sean and a Maria in my class and it is very difficult to cope with them. The avatars really provided the students with an excellent practice opportunity.

As a teacher educator, I noticed the anxiety during the first session, but by the fourth session it was clear that the students were finding their feet and were more focused on their practice than the newness of the experience.

The second theme that was highlighted was the "pause and redo" function within the simulator. The pre-service teachers stated that,

I really appreciated that I could pause the classroom when I felt out of my depth or if I thought I had forgotten something. I could breathe, get some pointers from the MT or TE and then go straight back and redo it

Although I got to redo some sections of my lesson, the avatars never responded in the same way, so I had to really think on my feet.

The mentor teacher commented that she found the feedback or coaching she could do during the pause as very helpful:

I can't stop a real class when the student is teaching because she will lose face with the learners, and it could affect her motivation; this was ideal and so necessary.

As teacher educator I got to see the effect of pausing on the demeanor of the students; they could heave a sigh of relief and realize that no harm was done and that as a teacher educator I was not judging them, but I was the support they needed. During teaching practice, you have to let them suffer through difficulty teaching moments often with serious repercussions for the learners and themselves.

The third theme was “coaching and feedback”. The pre-service teachers made the following comments:

I have never experienced this before. We usually get some feedback from our MT, and this often differs from that of the TE; they comment on different things

We never see our teacher educators during teaching practice only in our fourth year when they come and assess us

The only feedback we get is – good introduction, try to engage the learners more. Nothing that really helps us improve our practice and definitely not feedback on the overall purpose of our lesson such as teaching reading strategies. I didn't even know how to select them, I just randomly picked one that I knew something about.

The mentor teacher mentioned that the provision of coaching and immediate feedback was very appropriate:

Instead of observing a 40-minute lesson and seeing them go off track and floundering we could provide immediate feedback or coach them on a particular aspect and they could go and correct it.

As teacher educator, I have never gotten the opportunity of seeing a pre-service teacher respond to my feedback during practice. We never see the same student twice so feedback is usually just for the sake of compliance.

After-Action Review

The following theme indicates the focus on the after-action review stage, namely “focused reflection”. During this stage, the pre-service teachers mentioned that the use of their video recorded lessons help them to zoom into what was planned and discussed during the before-action review. The pre-service teachers mentioned that:

You never see yourself teach and now you can see exactly what you are doing and what not.

During the first session I commented on my ‘performance’, but by the fourth session I was critically looking at how I was really teaching the learners to work with reading comprehension strategies

The mentor teacher mentioned that:

the fact that we put the spotlight on how they were teaching, explicitly, reading comprehension strategies made me realize that during teaching practice I rarely give

the students focused feedback on the core practice – I tend to keep it general, classroom discipline, a bit of engagement and something about their choice of activities.

As teacher educator, I realized that what one sets out to do and what happens in the classroom very often are at odds and many students are oblivious to this; they are tuned into the learning, or lack thereof, of the learners. By focusing on the goal and what the purpose of the lesson was (i.e., our common understanding) our interaction was more targeted on the explicit teaching of reading strategies and whether the students were reaching the learners. I was also struck by the level of critical reflection on the part of the pre-service teachers. They were no longer obsessed with marks, but they were trying to hone their craft.

Discussion

Since the 1980s, research has indicated that in many primary and secondary classrooms teachers do not provide reading strategy instruction, which is concerning because teaching specific reading comprehension strategies such as predicting, summarizing, clarifying and questioning has been proven to improve learners' reading comprehension in both their first and additional languages (Brown, 2017). Learners are experiencing significant reading difficulties and they need well-prepared teachers. Pre-service teachers need opportunities for deliberate practice opportunities; nothing should be left to chance (Deans for Impact, 2016). However, research indicates that not all practice opportunities are created equal (Ronfeldt, 2015). According to Cohen et al. (2020, p. 210), "A puzzle for teacher education has been how to improve the consistency and frequency of practice, to ensure all teachers get the requisite experiences and feedback". Research indicates that when pre-service teachers need to learn core teaching practices, they can benefit from sequenced practice opportunities that increase in difficulty over time and along with scaffolded support from more expert educators (Karpicke & Bauernschmidt, 2011). According to Ericsson and Pool (2016), to harness improvement, pre-service teachers need more purposeful and deliberate practice that links approximations with structured, direct coaching.

Mixed reality simulation is a unique teaching tool in that it very closely approximates the actual environment in which pre-service teachers will complete their school-based teaching practice. Providing both contact and distance pre-service teachers the opportunity to teach in the mixed reality simulated classroom enabled the students to receive a similar teaching experience that included learners (avatars) from diverse backgrounds and with different personalities. Often students who are placed in rural schools are left on their own to cope with a classroom of 40-50 learners with no mentor teacher and no teacher educator for support and guidance.

An aspect that was extremely noticeable for the results is the developmental progression in the students explicit teaching of the reading comprehension strategies. During the first lesson, they were noticeably nervous and their lessons were very haphazard with a number of inaccuracies in their explanations and steps completely missed in their explicit instruction; the lesson tended to be either student-teacher dominated or learners were left to fend for themselves individually without comprehending how to use the reading strategies. Oxford (1990, p. 201) states that, "Strategy training should not be abstract and theoretical but should be highly practical and useful for students"; the same should hold for pre-service teachers. The fact that

the classroom could be paused, feedback provided and acted upon immediately enhanced the quality of the teaching. During teaching practice, students are summatively assessed, given some superficial feedback, usually focused on classroom management and learner engagement and seldom on the detail of the subject-specific content such as reading comprehension strategies and how this was taught.

The after-action review stage highlighted the importance of pre-service teachers reflecting on their own explanations, and modeling and linking it to the decisions they made and the reasoning behind the decisions (Tajeddin & Bolour, 2023) makes the mixed reality simulation environment ideal for linking theory and practice. Given that pre-service teachers need deliberate practice, as well as immediate and actionable feedback from mentor teachers and teacher educators to develop effective core teaching practices, mixed reality simulation is a promising approach for initial teacher education.

Implications for Pre-service Teacher Preparation

Findings from this study indicate that mixed reality simulation has significant implications for initial teacher education, offering unique opportunities to enhance the training and preparation of the teachers. Firstly, mixed reality simulations provide pre-service teachers with realistic and immersive experiences that closely resemble classroom settings. Through virtual scenarios, aspiring teachers can practice their skills, make decisions, and interact with virtual learners, allowing them to develop their instructional strategies and interpersonal skills in a controlled yet authentic environment. Secondly, in mixed reality simulations, pre-service teachers can experiment with different teaching methods and approaches without any real-world consequences. They can try out various language learning strategies, explore diverse instructional techniques, and receive immediate feedback on their actions. This risk-free environment encourages experimentation and supports reflective practice, enabling teachers to refine their skills and make informed instructional choices (Tajeddin & Bolouri, 2023). Thirdly, mixed reality simulations can be tailored to meet the specific needs and challenges based on the pre-service teacher's progress, providing personalized learning experiences. This individualization allows for targeted skill development and supports the growth of pre-service teachers at their own pace. Fourthly, mixed reality simulations can expose pre-service teachers to a wide range of classroom situations, including those that may be challenging or uncommon in real-world practice. This exposure helps them develop a broader understanding of teaching and prepares them to effectively respond to various scenarios they may encounter during their teaching careers. It promotes adaptability, problem-solving skills and cultural competency. Fifthly, mixed reality simulations offer opportunities for reflection and feedback, enabling the pre-service teachers to critically analyze their actions and improve their instructional practice. They can review their performance, receive feedback from virtual mentors or peers, and engage in self-reflection, all of which contribute to the development of a reflective practitioner mindset. Lastly, mixed reality simulations can facilitate collaboration and learning communities among the pre-service teachers and their mentors and teacher educators.

Conclusion

Mixed reality simulation provides pre-service teachers, mentor teachers and teacher educators with a distinctive practice setting and a consistent assessment platform, which enables them to

observe how pre-service teachers engage with “avatar learners” in ways that are challenging to emulate within a typical university classroom while also facilitating immediate actionable feedback with opportunities to pause and re-do. If implemented as a complement or supplement to, and not a replacement for school-based teaching practice, mixed reality simulation has the potential to promote deeper learning of core teaching practices such as the explicit teaching of reading comprehension strategies in a scaffolded environment. This supports Rebecca Oxford’s (2017) research that the explicit instruction of language learning strategies in a scaffolded environment provides learners/students with the necessary tools to actively engage in their own language and reading development. By systematically teaching and modeling effective strategies, teachers and teacher educators can empower learners to become independent and strategic language users.

Future research could focus on determining how effective mixed reality simulation is in supporting pre-service teachers to develop increased competence in relation to core teaching practices as evident in behavioral, cognitive, affective and attitudinal outcomes. It is also necessary to understand how simulations are being used and perceived across sites so a pool of shared knowledge can be built. By leveraging this technology, initial teacher education programs can better prepare future educators for the complexities of the modern classroom.

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References

- Archer, A. (2020, April 3). *Explicit instruction online series: The magic is in the instruction, Part 1* [Video file]. YouTube. <https://www.youtube.com/watch?v=s7XIZOFWIdM>
- Archer, A., & Hughes, C. (2011). *Explicit instruction: Effective and efficient teaching*. Guilford Publications.
- Ade-Ojo, G.O., Markowski, M., Essex, M.R., Stiell, M., & Jameson, J. (2022). A systematic scoping review and textual narrative synthesis of physical and mixed-reality simulation in pre-service teacher training. *Journal of Computer Assisted Learning*, 38(3), 861-874. <https://doi.org/10.1111/jcal.12653>
- Altınbaş, M. E. (2023). Exposure to target language vocabulary through novel extracts and computer game cutscenes. *Language Teaching Research Quarterly*, 33, 162-175. <https://doi.org/10.32038/ltrq.2023.33.09>

- Assiri, M.S. (2016). Integration of stimulated recall, self-observation, and retrospective interview in the collection of strategy data in computer-assisted language testing. *Studies in English Language Teaching*, 4(1), 104-122.
- Barron, E. R., Rupley, W. H., Paige, D., Nichols, W. D., Nichols, J., & Lumbreras, R. (2018). Middle school teachers' knowledge and use of comprehension strategies in discipline instruction. *International Journal of Learning, Teaching and Educational Research*, 17(10), 1–17. <https://doi.org/10.26803/ijlter.17.10.1>
- Bautista, N.U., & Boone, W.J. (2015). Exploring the impact of TeachME™ lab virtual classroom teaching simulation on early childhood education majors' self-efficacy belief. *Journal of Science Teacher Education*, 26(3), 237-262. <https://doi.org/10.1007/s10972-014-9418-8>
- Benedict, A., Holdheide, L., Brownell, M., & Marshall Foley, A. (2016). *Learning to teach: Practice-based preparation in teacher education*. Special Issues Brief. Centre on Great Teachers and Leaders.
- Borg, S. (2006). *Teacher cognition and language education: Research and practice*. Continuum.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <http://dx.doi.org/10.1191/1478088706qp063oa>
- Brevik, L. M. (2015). *How teachers teach and readers read. Developing reading comprehension in English in Norwegian upper secondary school*. (Unpublished doctoral dissertation). University of Oslo
- Brevik, L.M. (2019). Explicit reading strategy instruction or daily use of strategies? Studying the teaching of reading comprehension through naturalistic classroom observation in English L2. *Reading and Writing*, 32, 2281-2310. <https://doi.org/10.1007/s11145-019-09951-w>
- Brown, R. (2017). Comprehension strategies instruction for learners of English: Where we have been, where we are now, where we still might go. In S.E. Israeli (Ed.), *Handbook of research on reading comprehension* (pp. 543–567). The Guilford Press.
- Carver-Thomas, D., & Darling-Hammond, L. (2017). *Teacher turnover: Why it matters and what we can do about it*. Learning Policy Institute. <https://doi.org/10.54300/454.278>
- Cohen, J., Wong, V., Krishnamachari, A., & Berlin, R. (2020). Teacher coaching in a simulated environment. *Educational Evaluation and Policy Analysis*, 42(2), 208-231. <https://doi.org/10.3102/0162373720906217>
- Creswell, J.W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Sage Publications, Inc.
- Creswell, J.W. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Merrill Prentice Hall.
- Dawson, M., & Lignugaris-Kraft, B. (2017). Meaningful practice: Generalizing foundation teaching skills from TLE TeachLivE™ to the classroom. *Teacher Education and Special Education*, 40(1), 26–50. <https://doi.org/10.1177/0888406416664184>
- Deacon, R. (2016). *The initial teacher education research project*. JET Education Services, South Africa.
- Deans for Impact. (2016). *Practice with purpose: The emerging science of teacher expertise*. Deans for Impact.
- Dieker, L. A., Straub, C. L., Hughes, C. E., Hynes, M. C., & Hardin, S. (2014). Learning from virtual students. *Educational Leadership*, 71(8), 54–58.
- Dieker, L.A., Hynes, M.C., Hughes, C.E., Hardin, S., & Becht, K. (2015). TLE TeachLivE™: Using technology to provide quality professional development in rural schools. *Rural Special Education Quarterly*, 34(3), 11-16. <https://doi.org/10.1177/875687051503400303>
- Dieker, L. A., Hughes, C. E., Hynes, M. C., & Straub, C. (2017). Using simulated virtual environments to improve teacher performance. *School University Partnership*, 10(3), 62–81.
- Ericsson, A., & Pool, R. (2016). *Peak: Secrets from the new science of expertise*. Houghton Mifflin Harcourt.
- Gass, S. M., & Mackey, A. (2000). *Stimulated recall methodology in second language research*. Lawrence Erlbaum.
- Guba, E.G., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. SAGE.
- Jakobson, K., Soodla, P., & Aro, M. (2022). General and special education teachers' knowledge about reading comprehension processes and instructional practices. *Reading and Writing*, 35, 2229-2256. <https://doi.org/10.1007/s11145-022-10280-8>
- Karpicke, J. D., & Bauernschmidt, A. (2011). Spaced retrieval: Absolute spacing enhances learning regardless of relative spacing. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37(5), 1250–1257.
- Kiger, M.E., & Varpio, L. (2020). Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical Teacher*, 42(1), 1-9. <https://doi.org/10.1080/0142159X.2020.1755030>
- Klapwijk, N.M. (2015). EMC² = comprehension: A reading strategy instruction framework for all teachers. *South African Journal of Education*, 35(1), 1-10.
- Maxwell, J.A. (1996). *Qualitative research design: An interactive approach*. SAGE.
- Merriam, S., & Tisdell, E. (2016). *Qualitative research: A guide to design and implementation* (4th Ed.) John Wiley & Sons, Inc.
- Mirfatemi, F., Sadeghi, A., & Niyazi, M. (2020). Impact of supra-segmental features on reading comprehension in first and second language: A comparative study of Iranian EFL learners. *Language Learning Research Quarterly*, 20, 19-42. <https://doi.org/10.32038/ltrq.2020.20.02>

- Nel, C. (2022). *Bridging the reading instruction theory-practice divide through a mixed reality teaching environment*. SALALS conference, Potchefstroom, South Africa.
- Nel, C., Marais, E., & Dieker, L. (2020). TeachLivE™: Learning from practice in a mixed-reality teaching environment. In J. De Beer, N. Petersen & H.J. Van Vuuren (Eds.), *Becoming a teacher: Research on the work-integrated learning of pre-service teachers* (NWU Self-Directed Learning Series Volume 4) (pp. 43–64). AOSIS. <https://doi.org/10.4102/aosis.2020.BK215.02>
- NHS. Improving Quality. (2015). *Before action review*. <https://www.england.nhs.uk/improvement-hub/wp-content/uploads/sites/44/2015/08/learning-handbook-before-action-review.pdf>
- NHS England and NHS Improvement. (2021). *After action review*. <https://www.england.nhs.uk/wp-content/uploads/2021/12/qsir-after-action-review.pdf>
- Oxford, R.L. (1990). *Language learning strategies: What every teacher should know*. Heinle & Heinle.
- Oxford, R.L. (2017). *Teaching and researching language learning strategies. Self-regulation in context*. Routledge.
- Oxford, R.L., Rubin, J., Chamot, A.U., Schramm, K., Lavine, R., & Nel, C. (2014). The learning strategy prism: Perspectives of learning strategy experts. *System*, 43, 30–49. <https://doi.org/10.1016/j.system.2014.02.004>
- Pearson, P.D., & Cervetti, G.N. (2017). The roots of reading comprehension instruction. In S. E. Israeli (Ed.), *Handbook of research on reading comprehension* (pp. 12–56). The Guilford Press.
- Richards, J.C. (2015). Technology in language teaching today. *Indonesian JELT*, 10(1), 18–32. <https://doi.org/10.25170/ijelt.v10i1.1506>
- Ronfeldt, M. (2015). Field placement schools and instructional effectiveness. *Journal of Teacher Education*, 66(4), 304–320. <https://doi.org/10.1177/0022487115592463>
- Sampson, M. B., Linek, W. M., Raine, I. L., & Szabo, S. (2013). The influence of prior knowledge, university coursework, and field experience on primary preservice teachers' use of reading comprehension strategies in a year-long, field-based teacher education program. *Literacy Research and Instruction*, 52(4), 281–311. <https://doi.org/10.1080/19388071.2013.808296>
- Shaughnessy, M., & Boerst, T.A. (2018). Uncovering the skills that preservice teachers bring to teacher education: The practice of eliciting a student's thinking. *Journal of Teacher Education*, 69(1), 40–55. <https://doi.org/10.1177/0022487117702574>.
- Spaull, N. (2022). *2022 Background report for the 2030 reading panel*. Cape Town.
- Spaull, N. (2023). *2023 Background report for the 2030 reading panel*. Cape Town.
- Tajeddin, Z., & Bolouri, M. (2023). Decision making in English language teaching: Unpacking novice teachers' pedagogical reasoning. *Language Teaching Research Quarterly*, 33, 115–131. <https://doi.org/10.32038/ltrq.2023.33.06>
- Taylor, N. (2021). The dream of Sisyphus: Mathematics education in South Africa. *South African Journal of Childhood Education*, 11(1), a911. <https://doi.org/10.4102/sajce.v11i1.911>
- Taylor, N., & Mawoyo, M. (2022). Professionalising teaching: The case of language and literacy. In N. Spaull & E. Pretorius (Eds.), *Early grade reading in South Africa* (pp. 179–195). Oxford University Press.
- United Nations Educational, Scientific and Cultural Organization. (2014). *Teaching and learning: Achieving quality for all. EFA Global Monitoring Report 2014*. UNESCO.
- Vaughn, S., & Fletcher, J. (2021). Explicit instruction as the essential tool for executing the science of reading. *Reading League Journal*, 2(2), 4–11.
- Yin, R.K. (2009). *Case study research: Design and methods*. 4th Edition. Sage.
- Zeichner, K. (1999). The new scholarship in teacher education. *Educational Researcher*, 28(9), 4–15. <https://doi.org/10.3102/0013189X028009004>