

The Analysis: Teaching and learning theories participants demonstrated

Descriptors according to participant comments and lesson observations were correlated to infer teaching and learning theories, as well as to the SAMR model stages and TPACK framework descriptors, during the study of the influence of Virtual Reality (VR) as an educational tool on teachers' pedagogy.

Pseudonyms were used instead of participants' names

Table 1: Indicating the comments and codes for discussion related to virtual reality connections to teaching theories.

Participant pseudonym	Comments	Descriptors
Bhavna	You know, so it's to bring that comparison in, so it's still to guide them, but it's a different kind of context. So I don't need to know when a bus was meant that I can Google that. I don't need to know who you know, who looks like that, I can Google that. So yeah. I think it needs to turn on its head and I think people are scared. I think teachers are scared cause you're so used to quantifying knowledge. Yeah. You know, I think, I definitely think it would change the methodology. It would have to, it can't be a clip on which is what we do now. It can't be a clip on, it must be the whole, the whole thing. Yeah. The methodology would definitely change.	change methodology
Bhavna	I try to do more learner-centered teaching where I do a lesson is I teach a topic and I see how the kids are reacting to that particular topic.	learner centred teaching
Bhavna	inquiry based learning approach	inquiry based
Bhavna	So I use the ipads not all the timewe did it for the ecosystem projects, and then I booked out the ipads for three lessons, so they were able to research the organisms and research the things in the ecosystems. There are valuable things in using them	constructionism / using technology
Bhavna	Yes. I use VR and other technology, the kids use their iPads and things also in class to do research when we discuss topics. So I do make use of those sorts of things, projector, VR, I found helpful.	constructionism / using technology
Bhavna	If I see, you know, some of them [learners] drifting off, I try and change it to engage them. And then that's where my VR lessons come into play. And I've noticed that they thoroughly, thoroughly enjoy it. You know, they absolutely enjoy it	Learner participation and interaction
Dhriti	A Thinker's Key (Different uses) activity	critical thinking
Dhriti	A Red and Green Hat activity	critical thinking

Kgomotso	<p>And then, if we look at the use of the group work within the lesson, how did you feel that went in terms of this lesson?</p> <p>Speaker 2:</p> <p>It was a bit difficult for me as a teacher, because I prefer having the whole class doing the same thing, because coming up with different content, when you teach, it means you have to repeat. And if it were two groups, it was going to be better, because you'd know, I've taught one group, the other group is going out now. But now, because there were five groups, and they were having something like five minutes. It was so difficult for me to engage the people, the other learners who were not part of the VR at that particular moment, because they kept coming in and going out, coming in and going out. So at the end of the day, I think some of my learners missed some of the things that I had explained. It was a bit difficult on that part.</p>	<p>whole class activity.</p> <p>Individual or small group learning support assistance.</p>
Kgomotso	<p>How do you, how do you actually engage with your students?</p> <p>Speaker 2</p> <p>Um, I actually use the explanatory method. I explain, but, uh, I also allow my children to sometimes do group work, but because of COVID, it's a bit difficult. So when I do narrative and, uh, I explain then they engage. I, I actually make sure that they engage as a group though. They might be sitting diff like one group will engage, you ask questions. And I allow them to ask questions and answer questions as well as I use the phone sometimes. But the way I use the phone, I've got my booklets. So I print their own booklets and I'll be using my phone to read booklets for my own phone. And sometimes when we get to something that might be difficult, I Google quickly and I explain to them. So that's one way I use the phone as well. Oh know, and sometimes I use the project as I have said before. So when I get to something like in NS, let's say, I'm talking about, uh, the structure of an insect. And when I explain it, sometimes kids don't really understand it. So I will show a picture or I will show a video that shows exactly what I, I explained.</p>	<p>Explanatory method / Narrative strategy</p>
Mary	<p>So I use that inquiry based learning in my teaching and I actually apply the teaching style of being the art teacher,</p>	<p>Inquiry based method</p>
Mary	<p>"Last term we did, um, we did an ecosystem VR. Oh, which is cool. I can't remember which one it was, but it was very, uh, very nice. But, um, going back to your question, I think if you, for the first time ever using VR, just test it out with your kids and it's a trial and there's no right or wrong. I think it's trial and error. And you see what works for, you know, what works for your kids in your Class.</p> <p>not so much changed the way I teach, because my teaching style is that I'm very much involved with the kids. It's not behind the desk. We, I immerse myself with them. We will sit on the floor, have discussions and stuff. So this is, this has just added to, uh, I don't wanna say, you know, like the perfect, but this is added to what we, what we, what we do. We discuss things in class and this just becomes another thing that we do in the lesson."</p>	<p>critical thinking</p>

Sarah	<p>I would definitely like to say, right, we're gonna watch this video. Um, we looking at blady blah, um, look after this and then the next thing, and maybe have the road trip, um, the road trip kind of at the back of their minds, you know, I dunno if that's too much for them, but to have a road trip at the back of their mind say, now you're gonna watch a road trip of a different kind and now imagine. Yeah. So almost having pre-made questions. Yes. So, yeah. So I think, and you do that naturally. You just, you know, you just do that naturally. So yeah. To spend a bit more time watching the video myself, instead of just like looking going, oh, wow, this will be a nice experience. This will, this will spark. So I see myself more as a facilitator, as opposed to like, you know, pointing them in this direction, pointing them in that direction, which I suppose at this level is vital.</p> <p>I suppose an extra both. Yeah. So I love to facilitate and I like to open up and, you know, I think that's important. Yeah. And then I think for me though, it would have to be to guide them with skilled questioning as opposed to just very general broad, but to, to focus on specific, you know, specifics. Did you notice that? Did you see that? Oh, you didn't. Okay. Well, have another look and see, so have another look and see, so it was very rushed. I think we could have done this until the end of the day. Um, and really given a time, you know, so yeah. I think I would change that. I would. Yeah.</p>	<p>Critical thinking</p> <p>Learner participation</p>
Sarah	Effective pedagogies involve clear thinking about longer term learning outcomes as well as short-term goals.	Exploration and discovery by learner
Sarah	Yeah. So they were racing. They were starting to think that I'm on this road trip. I don't like it. What do I not like about it? Okay. So how can I solve the problem? Yeah. How can I make it better? So that's kind of what, you know, what you're hoping to achieve is rather than look at this and go, oh, this is it. You know? No, how can I make it better? How can I improve it?	Allowing problem solving and exploration
Sarah	<p>Allowing learners to share and grow knowledge:</p> <p>So in grade four, we do matter and we do the three sets of matter this year. For the first time in teaching, I haven't had to teach that foundational concept into the depth that I have before and little Arya comes along and says, no, they're actually four states of matter, you know? Yes, there are, but we don't teach you that in grade four, which is, I'm like, no, if that's what all of you are grasping, hang on. Let's look at plasma. Yeah. You know, so, so there are, so they said to me in the exam today, must we only say that there are three states of matter. In CS for the sake of the exam, we say that there are three states of matter, but we all know guys that there are four states of matter.</p> <p>We went, we went on and we looked at them. So we learned the molecular structure of solid liquid gas. We went on and we looked at the molecular structure of plasma and why they are ions in between.</p>	Exploration and discovery

Siara	I hadn't used group work before, so getting the learners used to group work was a challenge to start with, but once the learners realised they were going to rotate through the tasks and do all the activities, they relaxed and the lesson worked.	whole class activity. Individual or small group thinking hats, same lesson plan as Tammy
Tammy	it is actually quite nice we have done DeBono training, and thinking hats training. So now with this in the calendar Speaker 2: Now, we are focusing on these skills, focusing on those skills and then in our lessons we have to incorporate those skills. [00:07:30] So using VR to assist with the skills and the lesson content is useful, another resource.	De Bono Thinking Hats
Tammy	So our lesson plan, we used to do a two week plan, now we do a 6 week overview, we layout what we are teaching, our assessment and what we need to do the systems which need to be done or activities will be done. We do quite a lot of DeBono's thinking hats, thinking skills, [inaudible] [00:07:00] Thinking skills.	Thinking skills De Bono Hats and Thinking Skills
Tammy	So I, I think I sort of, use different sorts of teaching. I always start my lesson with discussing what we did previously ask them what they remember and remind them, then we do not so much, but chalk and talk to an extent, but I try to get the children involved and try to get their opinion, not so much to force my thinking on what they are doing and thinking. but I also like not so much the way we have been in sitting in the last year, you know, you, you don't want to call on the children, so children don't want to be called on, In a small group environment everyone gets a chance to have a say, pull out essentially the strength of the child	Learner participation Critical thinking
Thandiwe	Um, normally we do classes normally like lessons, and then, um, after the lesson, after I've taught, then I give them exercise to do, an activity to do it's usually a whole class thing. And then if there's a group that I need for remedial, I do take those for extra work or remedial, I give them something different from the rest of the class.	Explanation, whole class activity. Individual or small group learning support assistance.
Thandiwe	What is your main teaching methodology that you use? Speaker 2: Okay. Actually, Um, we used to do a variety of things, but actually now with Covid it's hard to do and maintain group work. especially if you are alone in a class. Yes. So with this thing we try to keep the whole class with a group of thirty learners. So with the Covid thing, we try to keep to the whole class because of that. Um, we do ask questions and answers, but most of the time it's the whole class, not really, um, we don't really do group work where they work together and then maybe they present to class, individual transitions. If you give them something they'll do individually.	Question and answer / Learners present ideas / Less group work due to Covid / Complete tasks individually

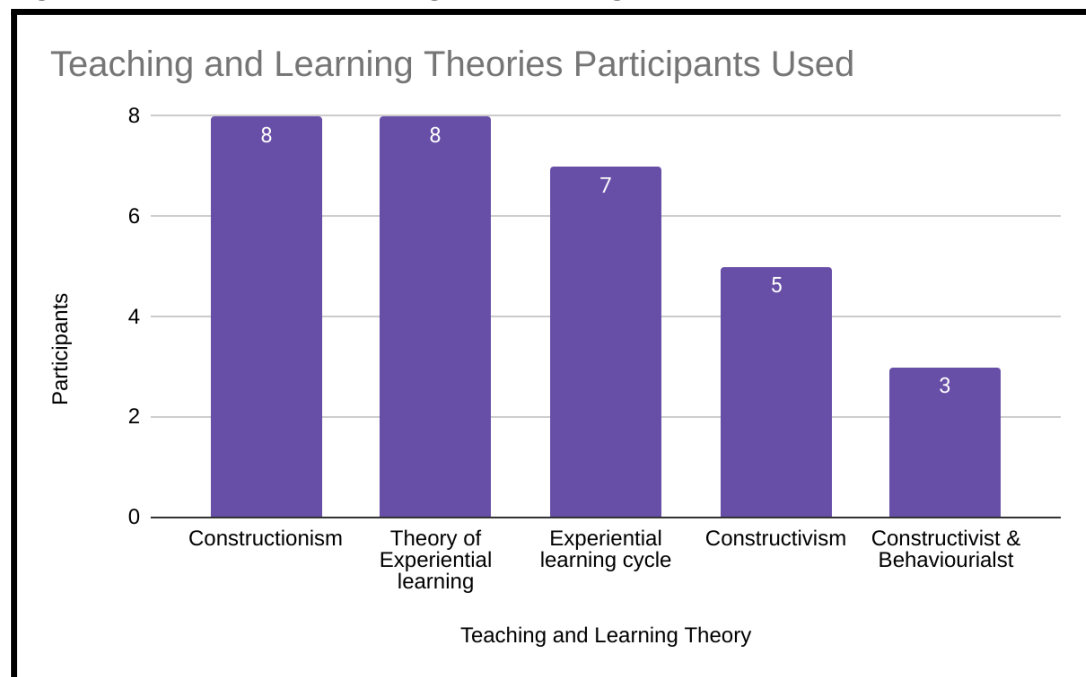
Table 2: Identifies the data was collated into the following table: exploring the participants' methods of teaching

Participant pseudonym	Method of teaching	Constructivism: the idea that cognition is developed through mental construction. This suggests that humans learn, constructing new knowledge by piecing together their past experiences	Constructionism: VR resource assisted with creation by learners of mental models to understand the world around them	Experiential learning cycle - defined as a learning process where knowledge results from the combination of grasping and transforming an experience.	Dewey's experiential learning theory, everything occurs within a social environment. Knowledge is socially constructed and based on experiences
Thandiwe	Question and answer. learner presentations	Behaviourist & Constructivist	constructionism	Experiential learning cycle	experiential learning theory
Thandiwe	Explanation, whole class activity. Individual or small group learning support assistance.	Behaviourist & Constructivist			
Tammy	21st century thinking skills: De Bono Hats - thinking skills	constructivism	constructionism		experiential learning theory
Sarah	Exploration and discovery	constructivism	constructionism	Experiential learning cycle	experiential learning theory
Saira	Whole class, tried group work for VR lesson for first time, using thinking hats in her lessons as part of school requirement	Behaviourist & Constructivist	constructionism		experiential learning theory
Mary	Inquiry based method	constructivism	constructionism	Experiential learning cycle	experiential learning theory
Mary	Critical thinking linked to UN sustainable goals				
Kgomotso	Explanatory method / Narrative strategy	Behaviourist & Constructivist	constructionism		experiential learning theory
Dhitri	21st century thinking skills: De Bono Hats - thinking skills	constructivism	constructionism	Experiential learning cycle	experiential learning theory
Bhavna	Learner engagement and interaction	constructivism	constructionism	Experiential learning cycle	experiential learning theory
Bhavna	Question, Discussion, Visualisation	constructivism		Experiential learning cycle	experiential learning theory

Table 2:Indicates the participants' interactions and comments summarised into the table, related to teaching and learning theory.

Participants' pseudonyms	Teaching and Learning Theory	Number of participants
All eight - Tammy, Dhitri, Mary, Bhavna, Thandiwe, Kgotmotso, Sarah, Siara	Constructionism	8
All eight - Tammy, Dhitri, Mary, Bhavna, Thandiwe, Kgotmotso, Sarah, Siara	Theory of Experiential learning	8
Tammy, Dhitri, Mary, Bhavna, Thandiwe, Kgotmotso, Sarah	Experiential learning cycle	7
Tammy, Dhitri, Mary, Bhavna, Sarah	Constructivism	5
Thandiwe, Kgotmotso, Siara	Constructivist & Behaviourist	3

Figure 1: Depicted the teaching and learning theories the participants used as a graph



The approach to teaching was drawn from the descriptors related to teaching and learning theories, as well as lesson observations.

Table 3: Indicates the participants' approaches to teaching.

Participants' pseudonyms	Approach to Teaching	Number of participants
Dhitri, Mary, Bhavna, Sarah	Learner centred	4
Thandiwe, Kgomotso, Tammy	Combination	3
Siara	Teacher centred	1

Figure 2: Depicted the approach to teaching by the participants

