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Transforming Curriculum in Health Sciences: An Interdisciplinary Approach, Using Multimedia Digitalisation

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Abstract: This paper promotes transformative learning in Health Sciences by introducing a curriculum intervention to leverage new knowledge in developing adaptive undergraduates. There are challenges in complex theory-laden Health Sciences programmes, where students merely use rote memorisation for assessment. Developing students to tackle complex problems using higher order critical learning is much needed for the health demands of local communities. We implemented a pedagogical intervention, using an innovative, digitalised medium in a collaborative, interdisciplinary environment while employing Bloom's taxonomy as a framework to critique our assumptions about optimising learning. In this way, we advance the skills of researching, discerning and critical knowledge production. These components have become important consideration for curriculum frameworks, while addressing the issues of inclusivity and disparities of access to digital media and internet in South Africa. Our research was guided by the following question: What are students' perceptions of engaging with innovative digitalised content in the module *Epidemiology: Parasitology, Immunology and Communicable Diseases*? The aim of this paper is to provide the results of an exploratory approach to action research applying a descriptive design and qualitative methodology. The paper culminates in recommendations for applications across disciplines.

Keywords: action research; critical skills; digitalised learning; interdisciplinary learning; transformative curriculum

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Introduction

The Centre for Development and Enterprise (CDE) refers aptly to the state of affairs in South African education as 'the silent crisis'.

> The failure to meaningfully transform South Africa's dysfunctional schooling system …is the quiet crisis and disaster of the democratic era… South Africa remains at the bottom of all international tables on learning outcomes: reading, maths, science. As a result, the majority of poor, mainly black, children in South Africa still do not receive the education they need to escape poverty. This is a national emergency that must be addressed (Schirmer & Visser, 2023).

From the above, it is evident that the South African Higher Education landscape remains ruptured and is still contending with the remnants of the effects of apartheid. Boughey and McKenna (2021) support the view that Higher Education Institutions (HEIs) are suffering from "huge hangovers of their colonial and apartheid pasts", while they have become "massified" to accommodate students from previously disadvantaged schooling backgrounds. Furthermore, Mlambo and Mpanza (2024) suggest that the country's university students fail to complete their studies in the required time owing to various interrelated factors. Moreover, the effects of COVID-19 have further exacerbated the learning challenges of university students.

In an extensive study conducted across 63 countries (Aristovnik et al., 2020), it was revealed that developed countries adapted to this unprecedented phenomenon by shifting their approaches to teaching and learning. These included student-centric methodologies and pedagogies, using latest digital techniques. However, the pandemic worsened an already dire situation in Higher Education, especially in historically underdeveloped, lower-income regions, where "students do not have equal opportunities to study efficiently due to different living conditions, domestic duties, and other factors" (Aristovnik et al., 2020). The pandemic simply worsened the "technological and digital gap" between developed and developing countries (Perrotta, 2021, p. 35). From a South African perspective, Mpungos (2023, p. 1) identified the "digital divide as the main hindrance to student effective learning, impacting on their cognitive and intellectual advancement". During COVID-19, these students were confronted by a lack of online resources, inconducive home environments, a lack of computer skills (hardware and software operations), incompetent digital skills (internet search, online communication, cybersecurity, use of mobile devices), high workloads, household chores, lack of learning devices, and poor mental physical and psychological conditions aggravating poor academic performance (Moodley, 2022).

Despite this dire state of affairs, the South African Higher Education landscape had to ensure academic integrity. There was the necessity to replace traditional, lecture-type methodologies, mostly delivering content to passive, non-participatory learners, with transformative teaching and learning to mitigate ongoing pedagogical challenges. Lewin and Lundie (2016, p. 2) correctly observe "a discrepancy between the 'production and conception of university education, and pedagogical and philosophical reflection'." Fataar (2016, p. 1) argues for "participation that brings process pedagogical orientations back into view to counter the rigid pedagogical orientation" that once informed the curriculum approach in South Africa. Without such engagement, Fataar (2016) asserts, constructive learning and meaningful curriculum delivery are impossible.

Often, in disciplines such as Health Sciences, there is too much reliance on traditional, theory-laden curricula limited to the discipline and with very little focus on interdisciplinary knowledge that encourages cooperative learning, granting students the opportunity to learn by making connections between ideas and concepts across different disciplines. Knowledge gained in one discipline is applied to a different discipline to deepen the learning experience (Pearce et al., 2009). Govender and Rajkoomar (2021) recommend the implementation of innovative curricula to enable constructive learning.

In our attempt to promote transformative learning in Health Sciences, we introduced a teaching and learning intervention, the purpose of which was to leverage new knowledge in developing adaptive undergraduates. Using a pedagogical intervention, which relates directly to the UNESCO Sustainable Development Goal of 'Quality Education', we employed curriculum that is transformative, creative and stimulating, to meet the needs of a modern generation of digital learners in a specific Basic Medical Science module. Haffejee (2021) demonstrated that photography proved to be an effective method in teaching public health in an undergraduate curriculum. It promoted higher order learning, such as problem solving as well as reflective and critical thinking. Students demonstrated evidence of transformation towards reflecting upon theory and how that articulated into practice. This modality improved and created opportunities for further skills development, especially in communication as it enabled students to disseminate knowledge to others. Haffejee (2021) established that teaching using this alternative pedagogy had the potential to produce reflective graduates who are responsive to the existing local health needs of the community.

Similarly, for this current project, we presented a pedagogical intervention to extend the boundaries in the creation of new knowledge. In so doing, we employed Bloom's taxonomy as a framework to critique our assumptions about optimising learning. Bloom's taxonomy (1956) remains a fundamental framework in education, guiding curriculum development and assessment strategies. It emphasises higher thinking skills, ensuring that education surpasses rote memorisation, preparing students to tackle complex problems and to think critically. Its hierarchical structure is divided into six cognitive levels (Knowledge, Comprehension, Application,

Analysis, Synthesis and Evaluation). Bloom's taxonomy encourages educators to create diverse teaching methods that reflect different levels of cognitive processing. At the lowest level, *knowledge* refers to the retention of information, at the next level the information is *comprehended*, and this can occur by paraphrasing or integrating new knowledge into existing cognitive frameworks, used to interpret experiences and understanding of the environment, thus knowledge is improved through *application*. In the next level of *analysis* critical thinking becomes important whilst the fifth level of *synthesis* involves the creation of the new product. At the top level, of *evaluation,* critical appraisal of the content is required (Adams, 2015). By designing activities that align with Bloom's taxonomy, students develop critical thinking skills essential for success. In this way, we set learning objectives for the creation of animations of aspects of the module to foster a deeper understanding as well as engagement, using creativity, which is one of the highest cognitive skill (Anderson & Krathwohl, 2001).

Epidemiology: Parasitology, Immunology and Communicable Diseases is a second-year module offered to Chiropractic and Homeopathy students (Faculty of Health Sciences). This module introduces a variety of concepts which can be challenging for students to grasp, thus rendering it too onerous for students to engage and optimise in learning. We introduced Project-based Learning (PBL) using innovative, generationally relevant, digital multimedia to optimise learning at even more sophisticated cognitive levels. The students were engaged actively in solving real-world problems that required creative and innovative solutions. The emphasis throughout the project was on students taking responsibility for their own learning and that of their group, while they developed deeper knowledge of content. The learning experiences were planned as highly participatory and collaborative, promoting critical thinking, teamwork, conflict resolution, communication skills, research, presentation skills, time management, independent study, creative solution seeking and innovative problem solving.

Goodwin (2012) points to the usefulness of multimedia in leading to higher order thinking skills, providing creative and individualised options for students to express their understanding and to prepare them better to assimilate the ongoing technological change in society and the workplace. Digitalised multimedia enhances the skills of searching for, discerning and producing information, as well as the critical use of new media for full participation in society. This has become an important consideration for curriculum frameworks.

The use of digitalised multimedia also addresses the issue of inclusiveness. As discussed earlier, disparities of digital media and internet access in South Africa are rife. Reducing this digital gap is important. Furthermore, students whose mother tongue is different from the official language of instruction can benefit largely if multimedia is infused into the curriculum (Alsied & Pathan, 2015; Golonka et al., 2014). Moreover, students with diverse learning styles can benefit from the use of multimedia. This provides different options for taking in and processing information, especially in the Health Sciences, making sense of ideas and expressing learning. It is evident that students learn best through visual and tactile modalities, and multimedia can enable them to 'experience' the information instead of just reading and hearing it, as in rote learning (Kenney, 2011). Our pedagogical intervention was to digitalise the parasitology aspect of a module in Health Sciences.

Our research was guided by the following question: What are students' perceptions of engaging with innovative digitalised content in the module *Epidemiology: Parasitology, Immunology and Communicable Diseases*? The aim of this paper is to explore the perceptions of students engaging with a transformative approach to teaching and learning.

Methodology

This qualitative study was conducted with a cohort of second-year Health Science Chiropractic and Homeopathy students registered for a module on *Epidemiology: Immunology, Parasitology and Communicable Diseases*. The module comprises the three sections – immunology, parasitology and communicable diseases.

In 2023, a class of 69 students enrolled for the module were introduced to digitalised multimedia for the section on parasitology. This was an an innovative modality for strengthening their engagement regarding course content. The assignment was to present digitalised content on a topic of their choice in parasitology, which would exhibit deep interdisciplinary knowledge, enhancing connections between ideas and concepts in an innovative way. While the module lecturer functioned as a facilitator of the content using traditional methods, students were requested to work in self-selected small groups with a maximum of four group members. A variety of learning methods were used throughout the project, including plenary discussions, individual and group presentations and

lecture-type sessions. In addition, for the first time, students were introduced to an expert tutor in digitalised multimedia, to assist in enhancing student projects with visually engaging content.

Students worked in their groups with initial ideation of the internal system of the human body, using illustrated diagrams. This was followed by sequential storyboarding, framing, designing, drawing and moving character rigs onto a 2D Adobe Photoshop software program to add motion to the static drawings – animation. This was immersive and experiential learning, where participants did not only acquire understanding of basic concepts of animation, vocabulary, foundational principles, software and hardware while developing the project; they also selected suitable visual techniques, sound and graphics to embed into the content. Introduction to Adobe Premiere provided students with the skills to engage in audio composing and exporting. The result was animated audiovisual presentations, bringing static characters, props and environments to life, exhibiting critical understanding of content in basic medical sciences. Integration of interdisciplinary skills brought together competencies from media, language, narration, drawing, graphic design, motion graphics, visual communication design, digital computing, animation video editing and medical sciences.

Following completion of the assignment, students were required to present their video or a PowerPoint presentation of their animation to the class. Their work was assessed as part of the formative assessment. Each group was allocated 10–15 min for the presentation, with a further 5–10 min to respond to questions by other members of the class, the lecturer and an independent assessor, who was not involved in teaching the class.

Students were then invited to participate in the research study. Four groups of students were invited randomly to participate in focus group discussions to ascertain their views of the new teaching modality. As data saturation was reached at this stage, no further focus group discussions were held. In total, 16 students participated in the research aspect of the study. Participation was voluntary and no student was forced to participate. Those who did not wish to participate were not penalised in any way.

The researcher not involved in the teaching of the module facilitated the focus group discussion, using a qualitative questionnaire guide. The focus group discussions were audio recorded, with permission from all students participating in these discussions. The following key considerations guided the study: (1) Describe your learning experiences using digital multimedia in your project; and (2) What new skills have you learnt?

Data were analysed thematically using the eight steps of data analysis of Tesch (Creswell, 2009). In brief: (1) The audio-recorded interviews were transcribed verbatim, in a Microsoft Word® document. (2) Reading and making notes on each transcript assisted in highlighting important key statements. (3) Groups of critical information were arranged to generate codes. (4) The codes were used to generate themes. (5) Similar topics were grouped together. (6) Subtopics linked to a particular theme were chosen as subthemes. (7) Patterns were uncovered, and interpretations drawn based on the themes. (8) The data were interpreted.

Prior to commencing the study, ethical clearance was obtained from the University Ethics Committee (IREC 118/23). Written informed consent was obtained from the students prior to the study. No names or other personal identifying data were collected.

Results

In total, four focus group discussions, comprising four students each, were held with second-year Health Science students.

Three themes emerged from the data: (1) Perceptions towards digitalisation; (2) Acquisition of new skills; and (3) improved retention of content.

Theme 1: Perceptions towards digitalisation

Initially, the students found the project daunting because they had no prior experience with digitalisation. This led to feelings of uncertainty towards their ability to adequately complete the task. Literature points to the normality of anxiety in such novel pedagogical contexts, where in this case, students felt uneasy with unfamiliar technologies (Ifenthaler et al., 2023). However, during the module they learnt the necessary skills, making it gratifying for them to complete the task. They also found it motivating to observe the work of the other teams.

> I knew we had to make a video, but like I didn't know how. And I didn't know how detailed the IT had to be and how we were supposed to animate it and like, it just was hard to grasp.

> Once we had gotten into the swing of things with all the lessons that we got on Photoshop, I found it a little bit easier. But in the beginning, it was daunting, and I think that's what the other student said as well. So, I found it hard to get into it, but I did find it quite enjoyable, and I thought that watching the videos was quite easy and like fun to learn about all the different teams and what they did. So, it was fun, but I did find it quite … scary and hard to grasp in the beginning. Student H

Moreover, students noted that the project boosted their confidence and creativity, which afforded them a sense of satisfaction.

> Other projects did not shine bright as this project because this one really, not only boosted my confidence but gave me a lot of creativity. Because when you are creating, editing the video, you start to put in ideas that you don't have, different ideas, and then when you put it into the video you discover the freedom, and you start to put them into practice, and you put them into the video. It was fun. Student J

The same student reiterated that the project was facilitative and assisted them in discovering qualities and abilities of which they had previously been unaware. Like Student H, Student J also expressed a sense of pride and satisfaction in their ability to include humour during the presentations.

> The most exciting experience was to use my qualities that weren't shining. When I was able to use it in this project to better develop and shine and to bring a lot of laughter for the people who are looking at the video, so I really enjoyed it. Student J

Although learners felt initial intimidation towards the task at hand, they gradually became confident and gave vent to their creativity, resulting in satisfaction. This can be corroborated with learner 'freedom', well established by Constructivist learning theory and Self-Determination Theory (SDT). Recognised Constructivist theorists such as Piaget (1972) and Vygotsky (1978) view learners as being liberated when they are included as active agents in meaning-making through exploration, problem solving and social interaction, enabling creativity. When learners are afforded the freedom to choose their own approaches and apply their own interpretations of experiences, they are enabled to generate innovative ideas based on prior knowledge. Similarly, SDT scholars (Deci & Ryan, 2000) ascertain that creativity is boosted by learner autonomy. They determine that such freedom leads to increased proficiency, enhanced intrinsic motivation and hence, self-directed learning.

In addition to the lack of experience with the arts-based medium, students were concerned about the amount of time that would be required for the completion of a successful project.

> I was very apprehensive because we had a lot of stuff going on at the same time, so it seemed like a big task to take on. Student K

In response to whether they would like this type of work to be continued and used in other modules, issues regarding time constraints were again a salient issue, but they echoed that this format of learning was beneficial.

> I think there's a fine line between the workload and having to do something like this. I think if the workload is very heavy for a subject, we may not have the time to engage in something like this, even though it would be more beneficial to have the work presented like this or even working through it is extensive. Student D

Despite the challenges, students mentioned that it made learning easier for those who were visual learners, in particular.

> …at first it was a challenge … we found it pointless. But at the end of the project, … it was so much fun doing it and … you know, the end result was to me, I really enjoyed and, like I said before, I'm a very visual learner, so it was it was good for me to remember everything. Student O

Students' initial concerns about time constraints are verified by Cognitive Load Theory (CLT) (Sweller et al., 2011). From this standpoint, students' perceived complexity of learning tasks stem from limitations of their working memory. The project allocated to students contained too many unfamiliar elements, coupled with

unclear instructions that may have led to confusion. This cognitive overload could have resulted in overwhelming learners' cognitive capacity, thereby influencing anxiety. In the absence of adequate scaffolding, learners may have struggled to assimilate meaningful information effectively. This could result in learners interpreting sophisticated cognitive demands as task 'difficulty' rather than a normal part of learning. According to Sweller et al. (2011), provision of clear instructions and incremental learning can reduce cognitive load, enabling learners to engage more confidently with complex tasks.

Such affective responses to technology-enhanced learning (TEL), such as intimidation and apprehension, are framed in theory that focuses on how learners' engagement with and outcomes of TEL are cognitively and behaviourally shaped (Chen et al., 2023). Chen et al. contend that sentiments ground motivation and attitudes of learners in social cognitive and information processing, where factors such as enjoyment, apprehension and perceived support are integral to how learners interpret, engage with and persevere in digital learning environments. These states, they argue, enhance the relationship between hesitation and acceptance of technology in learning, resulting in self-efficacy, confidence, creativity and perceived usefulness. The 'affect-as-information' model (Storbeck & Clore, 2008) proposes that, rather than analysing complex data, affective feelings lead to evaluative processing, enhancing information acquisition, judgement, decision making and sustained cognitive effort towards achieving outcomes. Students exhibited positive feelings that promoted safety in cognitive processing. Such emotion evidently leads to reciprocal peer support and deeper learning.

Theme 2: Acquisition of new skills

Some students were unaware that they possessed the ability to be creative. This creativity was unleashed by the newly learnt skill.

> Some of us are not exactly creative and he was introducing all these new platforms and all this with Adobe and all these kinds of things that we kind of expected to build up. We signed on even though we were not familiar with it, so it was like learning this whole new skill. Student L

Another student echoed the appreciation of creativity. Such learning took the students to a higher cognitive level.

> And ma'am, even if a project doesn't necessarily require like over-the-top creativity, I think it's always nice to be able to add that. Having learnt all this stuff on how to use the apps and learning how to present and stuff, it can only help us. We can just allow us to add that little extra creativity, that little extra pizzazz, just to make every project we do just that much better, which I think is [a] very important skill. Student F

Students recognised their acquired skills and were motivated to apply them towards their personal and continued use. This is suggestive of 'transfer of learning' as supported by contemporary scholars Bransford et al. (2000) and Perkins and Salomon (1992). Their 'Low Road and High Road' model is rooted in Thorndike's classical 'identical elements' hypothesis (Thorndike and Woodworth 1901), suggesting transfer of learning can occur when there are shared elements between tasks. Here, learners apply knowledge, skills and attitudes learned in one context to new situations. In our study, transfer was specific and limited to the project outcomes. However, learners benefited beyond the specific task to broader use. Perkins and Salomon's (1992) model advances this theory, highlighting how transfer can occur beyond shared contexts into 'high road' cognitive engagement and intentional strategy across varied contexts. Bransford and Schwartz (2001) augment this concept further, not merely connecting acquired skill to past learning engagements but to new environments. This should be a central notion towards promoting interdisciplinarity in Higher Education frameworks (Abildgren et al., 2025), positioning transferable skills acquisition within broader learners' outcomes into workplace readiness. Strategic contextualisation of the learning engagement into curriculum design potentially redirects the transfer of outcomes. This can be achieved by employing modern qualitative and mixed methods study approaches in the health sciences to yield social and cognitive skills transfer.

Students acknowledged the skill of the facilitators in teaching them. They also learnt the use of new programs, which they found beneficial.

> The facilitator was amazing. He showed us how to use the app and it was incredibly detailed and, initially, if we hadn't had any help, it would have been so hard to manage and get through. But he helped a lot, and we ended up using half Photoshop and then half using Canva and it

> was quite fun once we got started actually trying to put things together and get it going and, like seeing a video, seeing us actually make a video was really cool. Student F

This was reiterated by another student:

> He was very supportive to every group. So, everyone waited 'til the last week of submitting to send it through to him because it's a new skill. In the technical aspects, he was very helpful. The facilitator actually did the technical, providing more ideas to input into the content of your project and then, when we didn't have enough ideas you could tell the Animator to move like this and then like that. We shared experiences and ideas on how to create. Student M

Some students affirmed the inclusion of the learnt skill for personal use, reinforcing the awareness that the learning was lifelong and not restricted to the specific assignment.

> I did play around actually. I had an app with the stylus and stuff that you can actually go digital. We saw whether we can use that. We did end up not using it, but it was still like an experience for me to learn. I ended up doing some personal drawings. Student L

In addition to acquiring skills in digitalisation, time management and communication skills were also developed. Furthermore, continued use of these skills was anticipated.

> Ma'am, I think I definitely picked up some skills in time management with the amount that we changed our project and had to like to finalise all the details and stuff. I think time management as well as like communication between the people [and the people] and the group definitely is a skill that I picked up in this project that I've had to use up until now and we'll probably have to continue to use. Student F

Another student expressed a similar view:

> I mean overall so far, there has been a lot of challenges with time, but as we are getting into it, we realise that everything is not always going to work out in our paper. There's always going to be something that needs to be done. So yes, I feel like it has made us work a little bit [more] faster and more efficiently to get things done on time. Student E

Students' development of technical competencies, time management and communication skills while engaging in the learning experience is authenticated within 21st century skills development frameworks detailing how core technical competencies, and career and life skills, over and above cognitive capacities, can be developed as modern competencies, albeit incidentally. Trilling and Fadel (2009) advocate for the *Partnership for 21st Century Skills* framework, which contends that these skills can be developed alongside disciplinary knowledge while immersing students in real-world problem-solving environments. From this perspective, Chiva et al. (2024) support the view that these collateral abilities can be validated through performance-based assessments of the technology-integrated task.

Similarly, acquisition of communication skills was endorsed through the collaborative nature of the project, requiring group presentations, peer engagement, interaction and negotiation (Dolmaci & Acar, 2025). Students collaborated in small groups and shared responsibility to deliver on outcomes. Nguyen (2013) highlights how such peer scaffolding enables high quality dialogue, exploratory discussions and co-construction of knowledge. Collaborative learning and peer scaffolding in higher education are established in social constructivist theory, particularly Vygotsky's Zone of Proximal Development (Maghfiroh & Muttaqin, 2025). This approach views learning being facilitated through social interaction and peer cooperation, where engagement is enhanced, thinking reaches critical levels and learners' interdependence comes to the fore. By intentional design, effective structuring and scaffolding support from peers or instructors within a collaborative learning environment, academic outcomes are improved and equitable participation is harnessed.

Participants in our study exhibited awareness of their cognitive processes, which leads to life-long learning, purported by scholars like Pintrich (2002) and Eraut (2004). Their views are grounded in Mezirow's (1991) transformative learning theory, conceptualising how critical reflection and metacognitive process shifts learners' perspectives towards personal and career development – lifelong learning. In this way, students are able to adapt strategies that transcend far beyond particular discipline outcomes, motivating deeper engagement in the situation

at hand. In knowledge economies like South Africa, employment of such frameworks in higher education is central to employability (Candy, 2002).

Theme 3: Improved retention of content

This novel method of teaching with the incorporation of Arts into Health Science, improved learning. In particular, students conveyed that it improved their retention of knowledge.

> I also really liked it because it was very different. I did eventually remember the content that we worked on very well, so when studying I actually remember what we were working on. I think it was very interesting. Student M

This finding substantiates that, by engaging with material actively rather than passively (such as through reading only), deeper processing is achieved, influencing longer-term memory and retention. There was thus alignment of student learning outcomes with the higher levels of Bloom's Taxonomy. Creativity, one of the higher cognitive levels, facilitated retention of content. This is also supported by cognitive psychology research from the 'Dual Memory Framework' (Rickard & Pan, 2018). Such research points to the phenomena of 'testing effect', 'generation effect' and 'production effect'. Roediger and Karpicke (2006), for example, demonstrate how the 'testing effect' enhances memory and retrieval by continuous repetition of information. Similarly, McCurdy et al. (2017) found that, the 'generation effect' promotes the encoding process, stimulating accuracy of memory. And related closely to this viewpoint, MacLeod et al. (2010) assert that the 'production effect', actively enhances recall by creation of distinct encoding cues, enriching retrieval.

In addition to improved retention, understanding of the subject matter was enhanced.

> So, we did Trichomonas vaginalis and I can tell you for a fact that that was probably the one thing I literally did not worry about at all because, yeah, like from the project I understood it fully. So, like in the test like I could literally just breeze over that box because like I knew exactly what was going on, the symptoms, the course of the reproduction and all of that stuff. Student G

Another student reiterated:

> I just wanted to agree with that. In case you had to take quite a bit of time actually animating, so we did all of our information, gathered all our information in possibly a week and then the rest of the time we've spent animating. So, you have to go over, and you know, just keep rereading everything you've done to make sure everything's created, and then in doing massive voice-over, you just pretty much learn everything. And even now I could still probably tell you all the stuff that we learnt. And when we got to present, to presenting the videos, it's the same. It's very engaging to watch everyone else's videos and to see, you know, their posters and stuff. So, it I think was a huge, huge help in learning. Student F

Given the hands-on nature of the animation project, students repeatedly engaged in vibrant visualisations, using gesture, manipulation and other physical actions. Students did not merely receive visual information passively; they self-constructed understandings from their bodily experiences. This grounding of cognitive acquisition into sensorimotor systems leads to more sophisticated understanding of complex processes (Borghi & Cimatti, 2010). Such deep rooting of bodily interactions with the environment, and the resultant acquisition of new information is supported by 'embodied cognition theory' (de Koning & Tabbers, 2011). From this standpoint, students' mental models are enriched, while reducing cognitive load. Moreover, theory on 'material-based imagination' supports the view that students also engage their perceptual-motor systems to stimulate embodied interpretations of their animated images (Chow & Harrell, 2009).

Over and above the digitalisation, conducting research on the required scientific information was useful for both understanding and memory.

> Uh, that it did really help when learning for the test because when doing research and stuff going over all the information and looking for pictures and stuff, it just helped recall and remember in the information. So, it did help. Student J

It is evident here that students chose to research around the project, employing a deliberate method to actively determine what to learn instead of passively receiving information. Cognitive science and psychology theories (Winnie & Azevedo, 2022) authenticate how learning becomes more efficient this way, when the learner controls what information to acquire. Furthermore, when students decide what to explore and when they are self-driven by curiosity, memory is consolidated, leading to more profound encoding and better retention of learned material (Liu et al., 2024; Wang et al., 2025)). These findings exhibit how learner control and self-regulation of instructional content are empirically connected to improved learning efficiency and deeper cognitive processing.

Learning was improved for various types of learners. This auditory learner mentioned how the repeated voice-over for the presentations helped in learning.

> I also remember the parasite that we studied from our videos. It was very familiar to me, especially since I did the voice-over for the presentation because I am a very audio learner. Hearing, speaking and saying continuously, because of multiple takes, you are saying one thing so many times, I felt that it really did help with the memory. There was a lot of content, So, it helped with the confidence that what we chose is very good. Student L

A fellow visual and auditory learner shared:

> I'm a visual and audio learner I think it was beneficial for me. I remember the content that we did in our videos. Student M

The above experiences demonstrate empirical findings that show how recall of concrete words and image-supported text is more effective than abstract or text-only material. Although they function independently, they reciprocally reinforce the learning. This is supported by the dual-coding assumption (Paivio, 1990) that verbal and visual codes can function together to enhance cognition. Proposed by Paivio (1990), the Dual Coding Theory posits that these interconnected systems, where information is encoded from both communication conduits, increase the potential of retrieval. Mayer (2009) extrapolates on this foundational principle arguing that learners engage more meaningfully when they select, structure and integrate information across visual and auditory channels, albeit from their respective capacities. His Cognitive Theory of Multimedia Learning extends this framework to application of evidence-based multimedia principles of 'coherence', 'modality' and 'contiguity' in instructional design. In this way, he contends, transfer and retention are significantly improved. More recent studies (Clark & Lyons, 2011) further corroborate that the dual coding approach to instructional design principles lessens cognitive load. Mason et al. (2013) validate this methodology in STEM education, showing improved problem-solving with integrated visual–verbal representations in learning.

Learning outcomes improved not only for the content prepared and delivered by the respective group, but also for the material presented by other groups, indicating a broader enhancement in overall comprehension.

> I think it definitely helped seeing everyone else's videos as well because, in most of the videos, there wasn't a lot of information to take in. It was very summarised. So, I think seeing that also helped with our learning. Student I

Another student expressed the need for the release of all videos produced by the class to be accessed by the entire class prior to a test.

> I think they would be very good if we were able to actually get those videos before the test because I think I seem to remember it. I really wish that we'd seen everybody's video because it would have helped me remember the content. If you present it and then send it on a group or something so that when learning for the test, people who are who are more audio and visual learners can actually look at that content. Student K

Only one student felt that learning was more difficult. This was probably due to the student learning primarily by reading.

> So, for me personally, I thought that it creates it quite a bit of stress to think that I had to engage with this. Student B

The integration of humour into digitalised content was perceived to influence cognitive engagement positively, thereby facilitating improved retention and recall of information.

> There was one thing that I think we all still like remember is the one person came up with like almost like a nickname. So, it was about a parasite, and it happens to look like the face. We referred to the thing as Frank and I feel like that we were able to actually remember a lot of the stuff. So, we shared that funny thing to personify the parasite. I feel it gave us confidence to remember these things. Student L

Research supports the idea that deeper learning occurs when repeated performance leads to recall of information. In this instance, students found that watching other students' presentations and post discussions filled with humour furthered their understanding. Craik and Lockhart (1972) refer to this as 'elaborative rehearsal' based on their cognitive and educational theory which emphasises that such meaningful engagement is key to effective learning. This classic theory drives the idea that depth of processing, from shallow to elaborate, reinforces retention. Craik and Tulving (1975) extend this finding to apply to imagery and semantic organisation, resulting in enhanced recall and transfer. Craik (2020) backs the notion of memory going through dynamic levels of processing, leading to more profound semantic encoding. Elaborative rehearsal, he asserts, generates meaningful associations and enriching encoding. These findings are strengthened by educational psychology (Dunlosky et al., 2013) to strategies such as concept mapping, elaborative interrogation, and self-explanation to improve comprehension and long-term retention.

Discussion

The reflections of the students underscore the transformational impact of active learning projects, especially those that incorporate visual and interactive elements. Several pertinent aspects of the learning experience emerged, which affirm how being reflective enabled the students to contemplate, introspect, and think deeply about their experience (van Laren et al., 2014). In this way, new interpretations and insights were awakened (Kolb, 2015), thus enabling efficient learning.

Initially, students perceived the project as challenging and somewhat pointless, exhibiting scepticism about the relevance of the project, which aligns with literature regarding the reluctance that some students experience when faced with unconventional learning methods (Bell et al., 2013). This hesitation may stem from a lack of familiarity with the tasks involved, especially in environments where passive learning is more typical. This initial resistance is not uncommon in educational settings, particularly when students are introduced to new and unfamiliar tasks. The challenge probably stemmed from the novelty of the project and the skills required to complete it, which may have been outside the comfort zone of the students.

However, as the project progressed, their perspective shifted significantly. This change underscores the importance of perseverance and engagement in the learning process. Student understanding was developed through the process of cognitive scaffolding, where "If explanations are tailored to a particular learner, they are more likely to contribute to a deep understanding, because they then facilitate the construction of a coherent mental representation of the information conveyed" (Wittwer et al., 2010, p. 74). The learning experience thus fostered deeper understanding and engagement, enabling creativity as the highest cognitive skill (Anderson & Krathwohl, 2001). Our findings are corroborated by previous reports that the incorporation of arts-based pedagogies such as photovoice and role-play in undergraduate Health Science modules elicits an overwhelmingly positive response, highlighting the value of interdisciplinary tools in the teaching and learning environment (Haffejee, 2021; Van Wyk et al., 2017).

Moreover, by continuing with the project despite initial doubts, students were able to discover the enjoyment and satisfaction that can come from overcoming challenges. This transformation from scepticism to enjoyment is a valuable outcome, suggesting that the project was effective in engaging the students and in fostering a positive learning experience, as suggested by Fitzgerald and Fitzgerald (2020, p. 1): "If we can introduce more fun into the teaching and learning process, students will be more relaxed, will develop more positive peer and teacher relationships, and will become more engaged in their work". In fact, students enjoyed working with their small groups in preparing their own projects. They acknowledged that this interpersonal exchange of information facilitated better memory retention of the learning content. They also conceded enjoying the viewing of their peers' videos. Furthermore, they viewed the facilitator as a partner in the learning process. Such interactive engagement leads to participatory pedagogy. Fraser (2009) accentuates how active social engagement

is imperative for the optimisation of learning, thus "inserting the social–subjective to generate a pedagogy of recognition" (Fataar, 2016, p. 9). Jézégou (2010) and Anderson (2017) echo this sentiment in support of collaborative learning, which emphasises individual and collective knowledge construction. In fact, students enjoyed the experience so much that they opted to use these skills in their own personal space to indulge in drawings and to share their skill with others. Moreover, incremental learning surfaced when they expressed their desire to apply their skills to other modules.

The students' enjoyment of the project was linked closely to their learning style. As visual learners, most students found the use of animation particularly beneficial. This aligns with educational theories that emphasise the importance of catering to different learning styles (Kenney, 2011). Most students highlighted that they were visual learners, hence, this assignment improved memory retention by providing students with a tangible framework that linked theoretical knowledge to digital applications. Previous reports have indicated that the higher order thinking skills of students, corresponding to analytical thinking, are improved by visual learning, as understanding is enhanced when the information is seen (Raiyn, 2016). The students' reaction to using animation as a learning tool underscores the effectiveness of visually immersive strategies in reinforcing learning, which may otherwise be challenging when using traditional text-based methods alone. Visual aids, such as animations, can further enhance understanding and retention of information for visual learners. This finding aligns with studies that advocate the use of diverse, multimodal teaching strategies to accommodate different learning styles and to improve overall educational outcomes (Sankey et al., 2011). While the majority of students alluded to being visual learners primarily, some indicated that they were predominantly auditory learners, hence, this project also appealed to them and enhanced their learning. Previous studies in the Health Sciences have found that students entering Higher Education Institutions have a variety of learning preferences (Al-Saud, 2013; Vahed & Ally, 2020) thus, utilising a variety of teaching methods can enhance the learning effectiveness of students and can equip them to adapt to different learning styles and situations.

This study promotes transformative curriculum intervention by accentuating the potential of interdisciplinary, multimedia-led pedagogy in Higher Education, advancing from traditional rote memorisation toward higher order critical thinking. The integration of Bloom's taxonomy as a framework demonstrates that digitalised content in modules can foster advanced skills in research and knowledge production, aligning with literature that advocates transformative learning to address complex societal needs, as supported by Fataar (2026), Fitzgerald and Fitzgerald (2020) and Lewin and Lundie (2016). The creation of animations, aligned to the higher level of Bloom's taxonomy of *synthesis* as there was creation of a new product. This facilitated the learning process by enhancing memory retention in the lowest level of Bloom's taxonomy. To create the animation, the information was also comprehended, applied and analysed, thus the use of the intermediate levels of Bloom's taxonomy was necessary for the synthesis that occurred at the higher level. Another study also indicated that animations of difficult concepts improved understanding (Vagg et al., 2020). However, the latter study did not require the students to create their own animations but rather use available animations. The creation of animations by Health Science students is a unique contribution of the current research.

Given the numerous learning challenges that students in South Africa continue to face, we envisage that our findings will facilitate further explorations of how South African HEIs can replicate progressive learning solutions in enhancing the progress of students in the Health Sciences. However, intensifying such interventions throughout Higher Education in South Africa requires complex navigating of profound digital inequities. As noted earlier, disparities continue to plague students (Mlambo & Mpanza, 2024), especially in accessing digital media and the internet. This core issue remains a central challenge to inclusivity. Broader South African research (Boughey & McKenna, 2021) identifies primary barriers that hinder digital access in the first place – high data costs, poor connectivity and limited hardware access, particularly for students from disadvantaged or rural backgrounds.

A more realistic and effective way forward could be for Higher Education Institutions to move beyond merely providing digital tools. Adopting a 'digitally empowered ecosystem' such as investment in appropriate infrastructure, the inclusion of innovative and creative educational content and ongoing digital literacy interventions for both staff and students would be more feasible. A pragmatic way forward could include (i) 'curriculum integration' – embedding digital skills into core undergraduate curricula rather than offering them as electives; (ii) 'interdisciplinary collaboration' – merging resources and expertise across departments, as effected by our study; and (iii) 'stakeholder partnerships'– calling on government and industry to subsidise connectivity and

technological solutions. Leveraging such interventions could go a long way towards transforming South African Higher Education.

Conclusion

Attempts to promote transformative learning in Health Sciences by adopting innovative, digitalised multimedia in a collaborative, interdisciplinary environment, while promoting a curriculum that is creative and stimulating has proved worthwhile in meeting the needs of a modern generation of digital learners. Our pedagogical intervention did not only leverage the creation of new knowledge but also optimised learning in a module wrought with complex terminology and concepts. The nuance of implementing an interdisciplinary approach using multimedia digitalisation is that, despite the complexities experienced by the students, such an intervention added humour to content; it inspired creativity and had incremental benefits in the recall and memorisation of content, especially for audio–visual learners.

This research was conducted on a small group of students enrolled for one Health Science module. Our findings may thus not be generalisable across all disciplines. In order to obtain a more comprehensive understanding of the benefits of the teaching and learning modality across various disciplines, further work is required, including students enrolled for other programmes.

Declarations

Interdisciplinary Scope: This paper adopts an interdisciplinary perspective to promote transformative learning in Health Sciences by introducing a curriculum intervention to leverage new knowledge in developing adaptive undergraduates. It draws on pedagogical intervention to optimise learning, using an innovative, digitalised medium in a collaborative, interdisciplinary environment while employing Bloom's taxonomy as a framework. In this way, we advance the skills of researching, discerning and critical knowledge production, which have become important consideration for curriculum frameworks. The study addresses the issues of inclusiveness and disparities of access to digital media and internet in South Africa and culminates in recommendations for applications across disciplines.

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