

## Digital transformation of pedagogy in design education in the virtual learning environment

Christina Elgie, *Stadio Higher Education*

### Abstract

*The urgent need for pedagogical change, made possible by Digital Transformation (DT), is indisputable in design education (DE). This study considers the relationship between the evolution of Virtual Learning Environments (VLE) and the need for modernised pedagogy suitable for learning DE online, particularly by African students. The focus of the investigation is on the methods used in delivering DE curricula in relation to these technological platforms. This is carried out using a qualitative research approach with a phenomenological analysis framework. A conceptual model is constructed to explain the phenomena of interest. The research process reflects a constructivist epistemological paradigm based on the direct experiences and perspectives of the participants. This conveys the insights, views, and perceptions of DE faculty regarding pedagogical practices in VLE. The data collection instrument was derived from the conceptual framework and consisted of a cross-sectional survey. Research in VLE has recently broadened due to the socially crippling pandemic COVID-19, which has forced educators across the globe to adjust their methods of curriculum delivery rapidly by venturing into VLE (International Labour Organisation, 2020). This has highlighted the need for greater insights in utilising three-dimensional (3D) platforms in DE. Knowledge creation and imagination have been presented in the past predominantly in two dimensions but new multimedia mediums for design and concept development allow an abstract interpretation of design themes and events evolving into a 3D VLE. Aspects of the pedagogical system to be investigated are DT of pedagogy in teaching methods, tools, digital platforms, modern IT, virtual reality (VR) and augmented reality (AR). Innovative methods of learning design and delivery are not yet fully developed and further development of a strong conceptual framework is an immediate priority for high-quality DE. Ongoing development of a model for delivering methods of teaching in VLE are likely to become a major research topic for education providers as it will help them to attract students and to remain relevant in the future.*

**Keywords:** Design education, digital transformation, virtual learning environment

### Introduction

This research addresses a moderately new area that arose from the evolution of the Fourth Industrial revolution (4IR). Gleason (2018) postulates that 4IR is rapidly leading DE towards the Fifth Industrial revolution (5IR). Recent theoretical developments in the context of VLE have resulted in repeated appeals for pedagogical change in DE (Gleason, 2018; Haywood, 2018; Bryant, 2018). This is a complex problem and specific solutions are required to match alternative approaches that have been developed over the last few decades (Greenhow, Sonnevend & Agur, 2016; Timmis, Bradfoot, Sutherland & Oldfield, 2016, p. 48). Previously

proposed methods have been criticised (Bryant, 2018, p. 48); educators are facing many challenges affecting the value of applying innovative and envisioned pedagogical changes brought on by 4IR and these could lessen the credibility of DE teaching if DT is not addressed within DE learning design. The study contributes by developing methods of delivering curricula for teaching DE courses in VLE and examines how they are taught within an African university community. This study builds on previous work and proposes a new pedagogy to be implemented to support the effective dissemination of DE pedagogy using modern, virtual teaching tools and technologies. It is based on data regarding the modernisation of pedagogical techniques for DE, and the implementation of digital platforms to provide recommendations for future pedagogical practices in VLE.

DE is confronted with the challenge of using VLE domains productively and creatively as participatory practices, which is vital to facilitate artistic experiences. “Contemporary modes of communication are perhaps the biggest opportunity for new scholars to consider what is new about media and how new modes of communicating research can work” (Long & Wall, 2012, p. 487). Smal and Lavelle (2011) postulate that DE in South Africa should engage in a discourse which promotes research, emphasising issues of materiality combined with theoretical and historical constructs. Theorists hypothesise that design research is project orientated as the design process becomes the subject of design research. Smal and Lavelle (2011) explain that design practice and process of design research are interrelated. The golden mean is balancing theory and practice through the application of our designed world of images, objects, activities, and environments. Entanglement of perception, knowledge and reflection creates artistic experiences, and practical ways to initiate this into DE as competencies for reflecting, understanding and creating messages are essential. Long and Wall (2012) examine new ways of thinking about new media forms and challenge long-standing modes of thinking and communication in DE. The aim is to produce an account of personal and practical processes involved in adjusting to DT of pedagogy in DE and to develop modern pedagogy strategies.

#### *Theoretical contextualisation of DT of pedagogy in DE*

In this study, a rich body of literature was reviewed to document key contributions made to fields of DT of DE pedagogy in VLE. According to Penphrase (2018) the growing need for innovative DE online courses become evident; these include the hybridisation of Face-to-Face (F2F) learning and online technologies to facilitate the development of students’ learning skills and knowledge in an asynchronous learning environment. Spyropoulou, Pierrakeas and Kameas (2019) affirm that ground-breaking undertakings in distance learning involve Massive Open Online Courses (MOOCs) and this sparked great interest to incorporate MOOCs into DE. African DE curricula have the potential to reach a global audience and hence create a hybrid community for students and faculty from a variety of backgrounds.

#### *Curriculum connotation*

In asynchronous learning, the instructor and student do not engage in the learning process simultaneously. Asynchronous learning enables students to learn at their own pace and may mean less work for educators. Development of automatic tasks can lessen repetitious work, for example, grading exams and giving online classes. Previous studies investigating methods of study design using MOOCs (Zhang, Lu & Hu, 2019; Spyropoulou, et al., 2019) suggest paying special attention to the construction of curriculum connotation, selection of pedagogy and selection of educational strategies. Curriculum connotation is explained by Mulenga (2018) as viewing the curriculum as content of the syllabus, course outline and learning outcomes. If

asynchronous learning is part of the teaching design, collaborative learning communities should be established to support the student.

### *Collaborative learning communities*

An ongoing study by Abuhassna, Al-Rahmi, Yahya and Aman (2020) explores the construction of a new model to use in VLE and describes the use of purposeful interaction or dialogue. This view is supported by Bryant (2018) who agrees that communication should be constructive to support idea generation and exchange. This researcher determined that enabling communication between educator and students decreases the feeling of separation. Moreover, educators play vital roles by encouraging interaction, participation and communication. Good user experience (UX) of educational software and digital tools is crucial to ensure uncomplicated and manageable use. Well-designed software will make users feel more comfortable in engaging in VLE. Educators can reasonably effortlessly use tools and platforms without steep learning curves or excessively time-consuming training. Students should actively participate in the process of making information become knowledge; and communities involved with VLE can help students make sense of the content. A supportive and collaborative learning community helps students acquire and retain knowledge. This reduces isolation and imparts a sense of belonging and comradeship to motivate and ensure engagement.

In contrast, various studies comparing formats (like F2F and blended and hybrid learning) show different results; this might indicate that factors other than the format alone influence the delivery of a purely online curricula (Israel, 2015; Northey, Bucic, Chylinski & Govind, 2015). To date, little agreement has been reached as to what leads to a better learning outcome among students in online and blended learning programs (Fletcher & Bullock, 2015; Israel, 2015; Joksimovic, Gašević, Kovanovic, Riecke & Hatala, 2015). Traditionally, theorists have subscribed to the belief that an absence of F2F inhibits the development of learning skills and reduces in-person interaction between students and educators, affecting learning achievement (Israel, 2015). Theorists argue that the sense of belonging to a meaningful learning community is restricted in online and blended learning, disadvantaging students' learning experience as students struggle to make their social presence perceptible (Joksimovic, et al., 2015; Fletcher & Bullock, 2015).

This is debatable as social media and online communities have increasingly been shown to be able to form close connections, especially in areas of niche interests, connecting people from various social and economic backgrounds. Molteno (2017) states that true learning and engagement unify students, merging into an educational network, and the feeling of community in VLE develops a sense of mutual support and makes the experience more open, more human and more communal. Skinner agrees that participation through online discussions may be improved by harnessing Community Development Theory. This fosters multicultural awareness and an enduring appreciation for common liberties and opportunities. These strategies are appropriate for a comprehensive and global curriculum that can be adopted or reinvented for the African context in a setting which improves intercultural and interpersonal skills. Online educators play a critical role in creating the sense of community in VLE by augmenting this into the design of an online course and actively promoting it. During the OpenDoor webinar, Mitra (2020) emphasised the important role that instructors play in VLE by having a strong online presence, encouraging students to participate and validating students' discussions and, hence, creating online learning communities. "Personal development through VLE does not occur before but through participation" (Mitra, 2020).

### *Social interaction*

In the context of social interaction among students, it is important to mention utilising gamification and animation. Vyas (2020) shows that game-based learning outweighs the benefits of conventional pedagogy as gamification delivers better learning impacts, increases learning inspiration and improves critical thinking skills. Traditional pedagogy, which is instructor orientated and concentrates on memorising knowledge, is considered to have become outdated when compared to implementing and understanding key concepts in gamification pedagogy as it is enjoyable and interesting. Positive outcomes are accomplished through game-based learning and its practical application, which provides immediate feedback that enhances student engagement (Vyas, 2020).

Mitra (2020), in his latest ground-breaking research on distance learning, states that “in order to change the way we express the modern VLE curriculum, it should be created as a question”. Curricula for VLE should be converted into questions so that students know why educators are teaching certain topics. Mitra (2020) urges educators to embrace and adapt to new technologies and to adopt a self-organising system where access to internet resources and collaboration between students and technology are allowed during assessment. Rather than recalling knowledge, future assessment methods would focus on measuring the student’s ability to predict knowledge accurately and be assessed on defending their findings. In addition, Abuhassna, et al. (2020) refer to student autonomy as the navigation of independence and motivation towards learning. Penphrase (2018) postulates that within modern 4IR curricula an integrated system of educational needs should be explored through emerging concepts of self and identity. This includes considerations of the student’s independence, individuality, and social context versus genetic determination. 4IR has seen a rapid change in social interactions and relations, making DT of DE pedagogy imminent.

### *Teaching and learning transformed by technology and social media practices*

A modern approach should be developed which considers how teaching and learning are disrupted and transformed by technology and social media practices (Bryant, 2018, p. 48). Penphrase (2018) identified that the delivery of the modern curriculum in VLE needs to focus on social media and society, committing to identity groups in national and globalised learning environments. Active participation by students is vital, encouraging them to participate autonomously in line with their educational skills, objectives and former experience and background. Jandric (2017, p. 230) challenges our earlier notions of social interactions and argues that developing social media practices will enable new perspectives of our shared humanity, independent of geographic boundaries. This will directly impact the delivery of modern curricula required for DE operating in VLE. Tahir, Haron and Kaur (2018) explain that ubiquitous learning requires a new set of tools that can be implemented in the classroom and will enhance searching and collecting information online. Facebook groups can be used “to support the learning environment together with apps to provide students with real-time feedback from educators” (Mitra, 2016). Through Web 3.0 technology, social networks enable students to share their feelings, thoughts and ideas.

In addition, Tekdal, Sayginer and Baz (2018) postulate that Web 3.0 technologies enable the educator to design pedagogy using collective platforms and tools. This entails a combination of innovative course content, advanced search engines, virtual training laboratories, semantic web applications, 3D educational games, 3D encyclopaedias, semantic digital libraries, virtual worlds and avatars. Esposito, Sangrà and Maina (2019) explain that digital ecologies combine technologies and diverse ways of interaction, including virtually and F2F. Within the digital ecology, collaboration exists through organised social technology-based environments. With this evolution and with improvements notable in web technologies, educational materials

have improved noticeably in recent years. Tekdal, et al. (2018) predict that future education will rely on VR and AR due to innovations in 4.0 and 5.0 web technologies. Web 5.0 technologies include the implementation of “artificial based intelligent systems, virtualisation and cloud storage systems” (Tekdal, et al., 2018). VLE programs will be operable without installing software and will be replaced by intelligent operating systems allowing access to information anywhere using online storage services. Web 5.0 technologies will advance the use of avatars, AI robots and 3D virtual environments in the future VLE. Theorists predict that Web 5.0 hologram systems will be used for meetings and interaction with web content will be done via headsets.

New strategies can be evaluated, designed and applied for the development of online curricula (Molteno, 2017; Vyas, 2020; Northey, et al., 2015; Skinner, 2016; Tomas, Lasen, Field & Skamp, 2015). This process involves structuring material in small, practical portions that are easy to follow and are appropriate for the specific skill needs of individual students. Quick access to resources should be possible for students to engage routinely, anytime and wherever needed (Canvas, 2020). Active engagement strategies deliver fun and creative content and enable interaction through gamification and animation. Scenario-based practical activities and sharp, short video content can be provided to keep students interested (Canvas, 2020).

Evidently there is a need to investigate a format that can support pedagogy of DE, using digital platforms in VLE. The solution is not as clear as these theories suggest as the 4IR is evolving rapidly, leading into 5IR. The most sought-after benefits of new pedagogical methods within VLE are the enhancement of a learning ecological system, highlighting the sense of community and the encouragement of asynchronous and independent learning.

## Research design and methodology

Within the constructivist epistemology a phenomenological qualitative approach was followed to address the research question, namely, what delivery methods can be implemented to support Design Educators’ effective dissemination of pedagogy in VLE using modern virtual teaching tools and technologies.

### *Population*

The research relied on local and global knowledge; the phenomenological qualitative approach assists in identifying what is happening or being experienced. In this study this was done by gathering data from faculty members of progressive fashion schools in DE. The population is homogenous in nature as the participants share the same traits in the DE field. This means that the participants might be of different age and race, but all have the knowledge required for the researcher to conduct the study. Creswell (2012) defines a population as a group of individuals who have the same characteristic. The characteristic that participants in the population had to possess in order to be included in the study was to be members of Design faculties in higher educational institutions (lecturers and academic managers of DE).

Non-probability sampling was applied. Purposive sampling entails the researcher intentionally selecting individuals and sites to learn or understand the central phenomenon (Creswell, 2012); this means that participants for the study need to be information-rich within the context of DE. A link to the survey instrument and a consent form was sent via e-mail to relevant participants.

The sample consisted of nine participants, three full-time lecturers, one part-time lecturer, one head of department and four academic managers.

The educational level of the participants are one participant graduated from a college, one graduated from an university, six completed postgraduate master's' degrees and one participant indicated their highest qualification is a PhD.

### *Data collection*

The research question provided a vital conceptual framework for studying the data collected:

- What delivery methods can be implemented to support Design Educators effective dissemination of pedagogy in VLE, using modern, virtual teaching tools and technologies?

The qualitative paradigm best suits the reflective research approach and interactive re-examining of the main concepts and emergence of new directions and ideas during the data collection process (Merriam, 2009). The research design reflects a cross-sectional, qualitative survey. Data collected are in the form of words and sentences with underlying meaning, to describe applicable characteristics of the phenomena of interest from an individual-oriented perspective (Merriam, 2009). Gathering data, from the qualitative phenomenological perspective, relied on local knowledge to identify what is happening or experienced by faculty members in DE.

Kabir (2016) defines data collection as the “process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes”. Creswell (2012) explains that the cross-sectional survey has the “advantage of measuring current attitudes or practices. It provides information in a short amount of time, such as the time required for administering the survey and collecting the information”. Data was collected using Survey Monkey software. The research aims to explain the current situation. Therefore, the data collected is subjective as the aim was to collect reliable and credible information that would enable the researcher to answer the research question.

### *Data analysis*

The inductive coding process was used – themes were derived from the responses of the open-ended questions (Merriam, 2009). Data analysis involved repeating, tweaking and improving the coding process through several cycles, ensuring a thorough, complete and unbiased look at the themes throughout the data (Saldaña, 2012, p. 8). Colour coded text in a written form obtained by “cutting and pasting” the data verbatim from the responses was done to find themes and develop categories. Once codes were identified they were transferred to a flat coding frame (Merriam, 2009). It is essential that data analysis involves coding on different levels, about both the phenomenon being described (modern pedagogy of DE curricula in VLE) and the perspectives influencing the account given.

### *Ethical considerations*

Ethical considerations were considered ensuring trustworthiness, credibility, confirmability and transferability. To assure the confidentiality and anonymity of participants, consent forms stipulated that the open-ended survey answers would be transcribed. Ethically defensible research was attained through the transcribing of quality data during the data collection phase that is both valid and reliable (Rosenthal, 1994). Another ethical consideration was to acknowledge and state that participants might feel awkward if not knowledgeable in new technologies. It was communicated that the study would help participants identify gaps and opportunities for better preparation for the future in both pedagogy and in applying new



technologies in DE curricula. Academic integrity and scholarly ethics are of equal importance. Hence research must be reported honestly, shared with participants, not previously be published, not be plagiarised, not be influenced by personal interest and be duly credited to authors that made a contribution.

### Data analysis

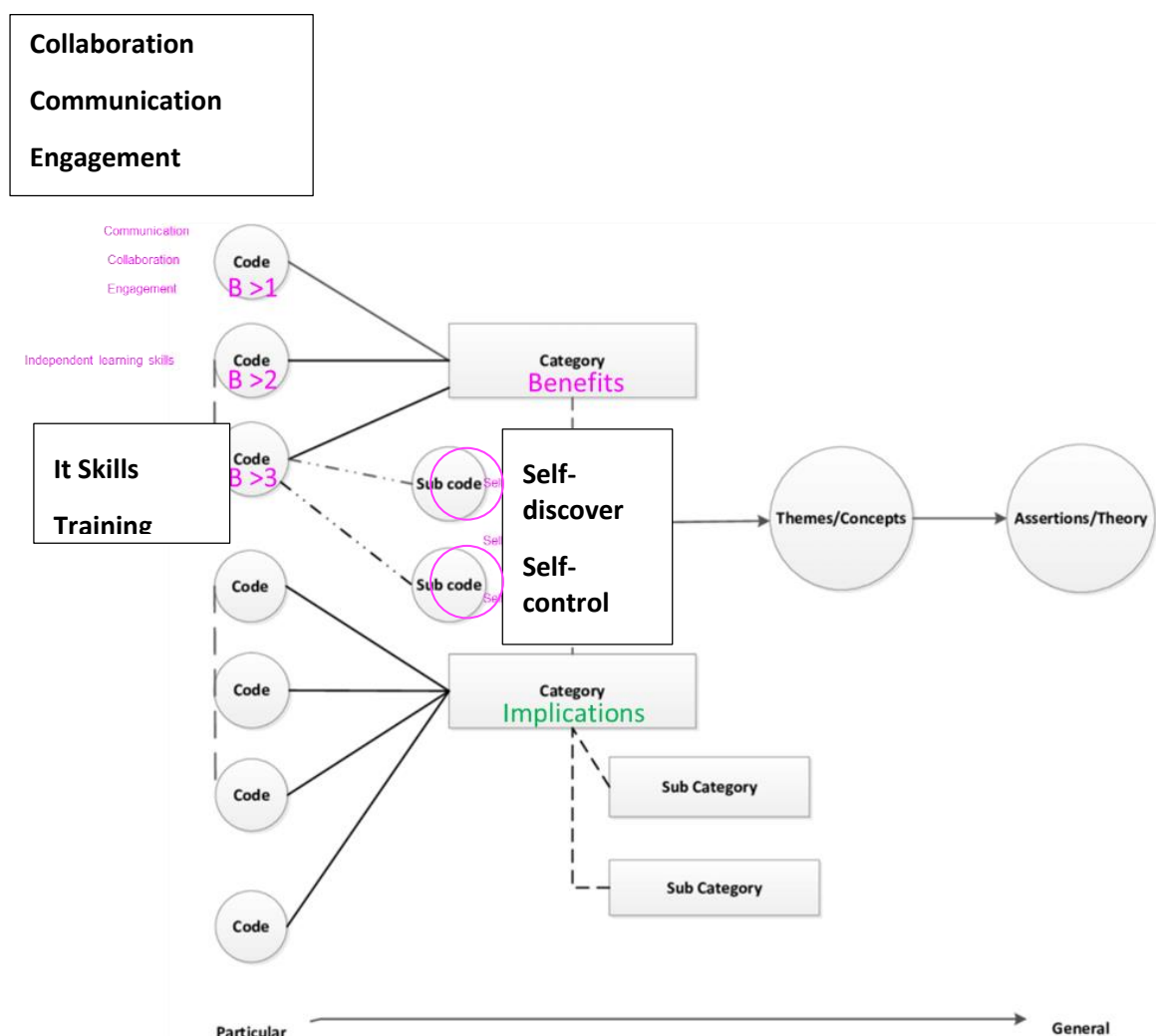


Figure 1: Saldaña's codes-to-theory model for qualitative research

The research question formed the foundation for developing the categories regarding this study. The survey data was analysed using systematic coding, resembling the method in Figure 1, proposed by Saldaña (2012).

The main categories identified using the code system (Appendix A):

- Benefits of digital learning tools and platforms in VLE (Pink B>);
- Implications of the impact of DT of pedagogical curricula in VLE (Green I>); and
- Development of practices of modern pedagogical curricula (Blue D>).

The third coding phase entailed developing subcategories or preliminary codes which were derived from the main categories (Saldaña, 2012). Patterns were identified by allocating qualitative codes (colour coded words) to capture the essence of connections of ideas and

concepts through looking at similar and regular patterns that emerged in the final coding phase as seen in Appendix B.

The research question produced three main categories, 34 Preliminary categories and Core Ideas, and 14 Final Codes as seen in Appendix B.

## Findings

### *Benefits of digital learning tools and platforms in VLE*

The open-ended answers within the survey illustrate that digital platforms in VLE develop skills such as communication, self-confidence and independent learning in an asynchronous manner. Regardless of this, student motivation to participate is still a concern due to the student's lack of self-confidence. The key benefits of using digital learning tools in VLE include communication, collaboration, interaction, knowledge creation, diversity and flexibility. From the results it is evident that a strong relationship exists between communication, interaction and collaboration within VLE as substantiated in the literature. This relationship may partly be explained by the passive use of VLE rather than promoting active learning; participants listed forums as one of the least effective tools in teaching online.

VLE helps build a feeling of community, enhance communication and improve interaction as shown by the sub-category 'Interpersonal Relationships' between educator and student, and among students (Penphrase, 2018; Spyropoulou, et al., 2019; Molteno, 2017; Mitra, 2020; Skinner, 2016). This in turn supports collaboration and resource sharing (Molteno, 2017). The research substantiated that communication should be constructive as this lowers the sense of separation between learner and educator. Esposito, et al. (2019) shifts the focus to learning ecologies and context as these play an essential role in student participation in the community of practice. Knowledge creation is supported by the sub-categories of self-discovery and students' social skills by assisting them to stay up-to-date by honing information-seeking skills (Mitra, 2020; Skinner, 2016). Through diversity and flexibility, different learning styles can be accommodated. One interesting finding is that diversity within VLE assists in the creation of knowledge, as the quality of learning is enhanced by enabling educators to deliver information more effectively and by supporting the educators in meeting the needs of students' diverse learning styles in DE.

### *Implications of the impact of DT on pedagogical curricula in VLE*

The major challenges that DE educators encounter in teaching are a lack of student motivation, confidence, participation, online access, pedagogy to incorporate different learning styles, lack of comprehension from students and time constraints. Within the 'Implications' main category, perceptions include both negative and positive notions.

The current study found that the most serious challenge of DT in VLE is students' lack of self-motivation which directly impacts participation, engagement and interaction (Molteno, 2017; Vyas, 2020; Northey, et al., 2015; Skinner, 2016; Tomas, et al., 2015). The delivery method used for DE course content could directly negatively influence the students' participation and motivation. Negative perceptions concerning technical difficulties are online access, internet connectivity, lack of equipment, time and ease (Esposito, et al., 2019; Lamprecht, 2020). This has a direct influence on the productivity of both students and educators. These views are supported in published research and theoretical concepts (Aoued, Hasnia & Mammeria, 2016; Canvas, 2020) as the learning outcomes of contemporary DE aim to enhance participation



rather than isolation. Keeping students engaged and motivated was generally difficult. New strategies to motivate and engage students should be investigated (Molteno, 2017; Vyas, 2020; Northey, et al., 2015; Skinner, 2016; Tomas, et al., 2015). These methodologies should encourage autonomy for students, allowing them to act independently and increase motivation towards learning (Abuhassna, et al., 2020; Penphrase, 2018).

#### *Development of modern pedagogy for DE online curricula*

The development of modern DE online pedagogy depends on integrating course collateral characteristics. The educator's online skills, expertise and pedagogy (Zhang, et al., 2019; Spyropoulou, et al., 2019) depend on previously established competencies, knowledge, approach, instructional and pedagogical skills (Esposito, et al., 2019; Greenhow, et al., 2016). Support and training together with the earlier experience of the educator are necessary for change to take place at the wider institutional level (Tekdal, et al., 2018). In this context, enough room to manage and combine informed discussions, training workshops and UX of platforms are vital. Another important finding is that collaborative learning tools are not always effectively used. A possible explanation for this is that time constraints hinder the training process. These factors may explain noticeable links between the implications and the development of practices. Better general computer skills will be of value when using tools and resources to enhance the quality of learning. This study found that a combination of strategies should be employed to accommodate online and offline teaching using open source collaboration applications. As opposed to traditional pedagogy like F2F, creative design curricula include scaffolding of activities, combining various pedagogy and the interactive use of digital tools and platforms in VLE.

## Recommendations

The results obtained from this research can be used to develop targeted interventions aimed at improving pedagogy of DE in VLE. In delivering a design curriculum, a combination of teaching methods should be used, such as, online discussion, online communication, online examination and online homework, including recorded educational material and assessments that contain multiple-choice quizzes or peer-review exercises. Studies suggest an “overarching pedagogical frame, explicit scaffolding of learning activities (through podcasts or online tutorials), appropriate use of media, hands-on assessment tasks, online forum discussions and student-staff communication is vital for students’ learning experience” in VLE (Tomas, et al., 2015). Collaborative learning and communication should be adopted using various collaboration platforms for discussion and feedback (Abuhassna, et al., 2020). Interactive exercises will enhance motivation and keep the learning process interesting, creating a pleasant atmosphere.

From the results, developments in web technologies need to be considered in the context of DT pedagogy of online curricula. New horizons are possible using web technologies and 3D environments in VLE. Possible directions for future development can be attained by exploring the future of Web 4.0 and Web 5.0 virtual and augmented realities in DE. Recommendations supported by this study, both from the literature and participant feedback suggest that the development of targeted interventions aimed at practical processes should involve adjusting DE module structures. This includes careful selection of the most engaging lecturers to present the courses while those with the most engaging writing or editing styles develop the content.

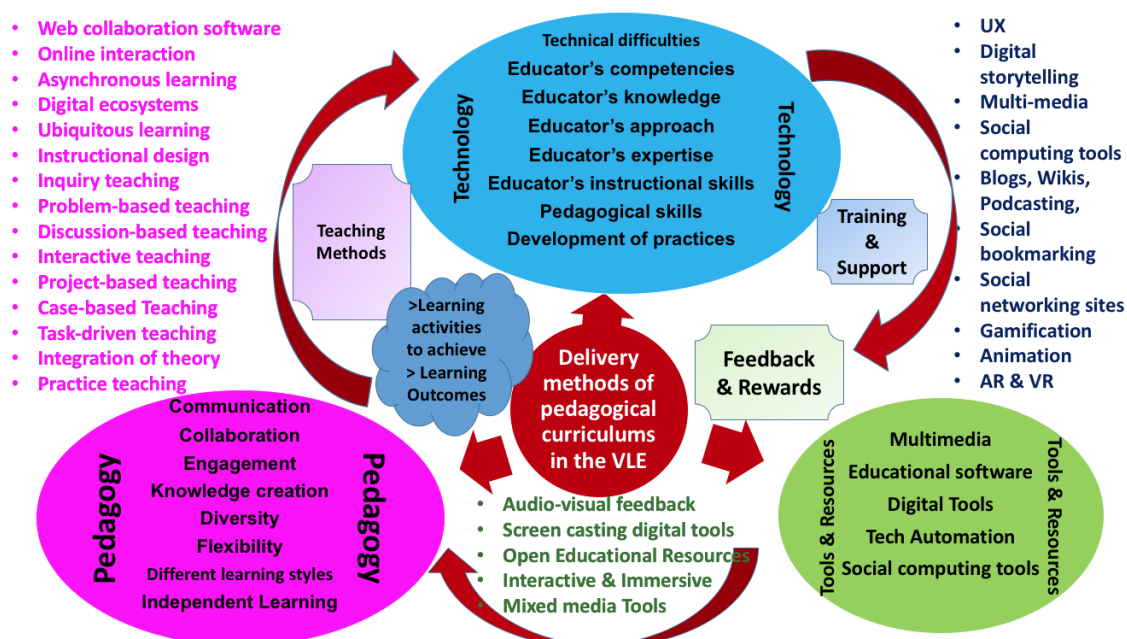


Figure 2: Proposed model for pedagogy of DE curricula in VLE

Technology provides an array of possibilities to use in DE and pedagogy in VLE. Esposito, et al. (2019) support the notion of VLE platforms that allow adaptation to students' learning styles so that content can be presented according to personal preferences (text-based, video/visual, auditory or interactive content, for example, gamification or practical activities through AR/VR, simulation, gamified or peer-reviewed feedback). Other important ways to keep learners engaged is through group work and social learning (social pressure to keep on learning), regular/formative assessment so the student gets continuous feedback as is made possible by tech automation. Lastly, an important way to keep students motivated is through positive reinforcement or regular reward scheduling where rewards can be as simple as encouraging words, praise, points accumulation or through gamification as the student progress through the work.

Regarding the implementation of pedagogy of DE curricula in VLE, the focus should be on the structure of course design and based on theories and previous literature relating to the subject matter (Abuhassna, et al., 2020). A constructive alignment design for teaching is recommended by Aoued, et al. (2016); this implies building on knowledge of how students learn. Learning activities should focus on achieving the intended outcomes rooted in instruction and assessment. The organisation of content should be according to the different characteristics of curriculum and chapter content. Emphasis on combining pedagogy should be based both online and offline to enable effective mixing of systematic teaching methods. Combining delivery methods including problem-based, inquiry, interactive, discussion-based, project-based, task-driven and case-based teaching and integration of theory will improve teaching efficiency and effect.

## Conclusion

Experienced academic managers with clearly communicated vision are necessary for change to take place. For design curricula to evolve, communication, interaction and cooperation should occur at all levels within DE (between lecturers and students, students to students) through cooperative learning. The latter should occur between educators (for example, to learn cooperatively, share knowledge, develop teaching material and refining teaching

methods), educator to students, student to student, educator to industry (to make certain that training topics address actual skills needs) and student to industry (to provide students with practical exposure, and to smooth the recruitment process for future employment).

VLE digital platforms may be considered a promising component of the teaching environment, allowing critical engagement when implementing changes of pedagogy and the design of modern DE curricula. This debate is not yet complete because the methodological approaches of existing studies are often qualitative and based on field observations or retrospective narratives. Hence, it is still in its infant stages of developing curricula that can support the relationship between DT in VLE and pedagogy of DE curricula. Bryant (2018, p. 37) and Haywood (2018, p. 117) validate these views speculating that modern DE can navigate and excel using vital platforms for pedagogical transformation and technology. Further research is required to investigate whether different learning methods have different impacts on pedagogy of DE in VLE. There is abundant room for research in determining which tools in VLE have the greatest impact on student learning. Future studies could investigate the association between the evolution of technologies used in design industries and the alignment of modern pedagogical curricula.

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## Appendix A: Coding framework

Transcribed Verbatim	Respondent (R)	Main Categories	Preliminary Codes = Sub-categories	Final Codes	Code Allocation
Absolutely agree that navigating e-learning platforms is a skill in itself and student training on this is highly recommended if not absolutely prudential.	R9	Benefits.	Positive notion of perception. Problem solving skills. Self-discovery. Self-motivating. Self-control.	Independent learning skills. Engagement	B > 2 B > 1
Online learning can enhance independent learning From observation, it seems that this platform is stronger suited to independent learning as students often opt for asynchronous learning.	R6	Benefits.	Positive notion of perception. Problem solving skills. Different learning styles. Ease of use.	Independent learning skills. Flexibility Diversity.	B > 2 B > 4 B > 4
Virtual learning environment enhance interpersonal	R2	Benefits.	Interpersonal Relationships. Self-discovery.	Communication. Collaboration. Engagement.	B > 1 B > 1 B > 1

relationships between the lecturer and individual student. I do agree but as a qualifying factor again it depends on the circumstances, the personalities involved and the context.			Self-motivating. Self-control.		
From experience, I have had students with no prior computer training that have become accustomed to utilising the machine as a tool. I equally believe this can be achieved for online learning if a student is driven and has the correct aptitude.	R6	Benefits.	Personalisation. Problem solving skills.	Flexibility. Diversity. Independent learning skills.	B > 4 B > 4 B > 2
Online learning platforms provides powerful resources for gaining academic knowledge. Strongly agree	R1 R2 R3 R4 R5 R6 R8 R9	Benefits.	Social skills. Staying updated. Self-discovery. Self-motivating. Self-control.	Knowledge creation. Collaboration.	B > 3 B > 1
Due to the nature of its diversity, knowledge covered by industry professional from various parts of the world and cultural backgrounds can be accessed by learners. The width, depth, practical and theoretical spread strengthens its case as no faculty is diverse enough to satisfy these requirements.	R6	Benefits.	Information seeking skills. Social and Cultural Knowledge. General or new knowledge. Self-discovery. Self-motivating. Self-control. Problem solving skills. Different learning styles.	Knowledge creation. Collaboration. Independent learning skills. Diversity.	B > 3 B > 1 B > 2 B > 5
Strongly Agree, Online learning provides an opportunity for collaborative learning and activities for students. It is effective, but requires the facilitator to have strong Skills in online pedagogy and e-learning design.	R9 R1 R2 R3 R7 R9	Benefits.	Self-discovery. Self-motivating. Self-control.	Communication. Collaboration. Engagement.	B > 1 B > 1 B > 1
Online learning is helpful in developing student's problem-solving skills. It is certainly helpful	R9	Benefits.	Problem solving skills.	Independent learning skills.	B > 2
Virtual learning environment provides the best ways of giving	R4	Benefits.	Feedback.	Engagement. Communication.	B > 1 B > 1



feedback to students. Students can watch it over and over if they miss something.					
Online learning can accommodate learners having different learning styles Yes, this has been observed.	R9	Benefits.	Different Learning styles. Ease of use.	Diversity Flexibility	B > 4 B > 4
Transcribed Verbatim	Respondent (R)	Main Categories	Preliminary Codes = Sub-categories	Final Codes	Code Allocation
		Implications:	Perceptions: Negative notions Positive notions		
A lack of confidence in using the platform will in all likelihood result in lower engagement and worse results.	R9	Implications.	Negative notions.	Self-confidence. Confidence in own skills.	I > 1 I > 1
The caveat is that many students don't participate at all unless a mark is allocated. Therefore, the caveat is "depending".	R9	Implications.	Negative notions. Self-motivation.	Lack of Participation. Lack of Motivation.	I > 3 I > 3
Problem solving skills: In my experience students do not problem solve or try hard enough by themselves. Possibly due to the belief that a solution is always available on YouTube. In this sense it has become an unhealthy and habitual crutch.	R6	Implications.	Negative notion of perception. Self-motivation.	Lack of problem-solving skills Lack of Motivation	I > 3 I > 2
The pandemic lockdown policies resulted in full online teaching requirement. This requires a high degree of computer usage and as a rule requires reliable high-speed internet connectivity.	R9	Implications.	Internet connections.	Technical difficulties.	I > 4
Online access for both students and lecturer is hindering progress of students. This is a macro-problem for this industry and SA as a whole. We simply do not have the connectivity infrastructure	R9	Implications.	Internet connections.	Technical difficulties.	I > 4
Online access for both students and lecturer is hindering progress of	R4	Implications.	Internet connections.	Technical difficulties.	I > 4

students. Some students may have problems with connectivity, but online access is not a setback.					
Online learning can accommodate learners having different learning styles But students that have poor comprehension may seriously struggle with online learning. I have students that I have to explain their content in their own language for them to understand what is required.	R3	Implications.	Comprehension.	Different learning styles.	I > 5
This is dependent on the type of skill you want students to be able to demonstrate. We find that deep learning is still problematic in online spaces.	R9	Implications.	Comprehension.	Different learning styles.	I > 5
Online learning can accommodate learners having different learning styles Except for the students who prefer learning in person.	R4	Implications.	Comprehension.	Different learning styles.	I > 5
Lecture mainly theory so no pictures to share	R3	Implications.	Negative notion of perception.	Teaching methods.	I > 6
I found this area to be the most problematic: 5% – 10% of students would routinely participate. We observe low participation rates in these generally.	R9	Implications.	Forums.	Lack of Participation. Lack of Motivation.	I > 2 I > 2
If forced they will participate. Left to the students own devices it is completely dependent on the habits of the Student.	R6	Implications.	Forums.	Lack of Participation. Lack of Motivation.	I > 2 I > 2
Discussion forums are ineffectual.	R4	Implications.	Forums.	Lack of Participation. Lack of Motivation.	I > 2 I > 2
The context for my answer is based on timing (during COVID-19 pandemic) which effected students' confidence, emotional well-being, levels of anxiety, and practical impediments such as	R2	Implications.	Negative notions. Lack of equipment. Online Access. Time and ease.	Self-confidence. Confidence in own skills. Technical difficulties. Time Management.	I > 1 I > 1 I > 4 I > 7

connectivity and lack of equipment were all factors that hampered progress in the online arena, I do, however, feel that under favorable circumstances students would interact and respond in an online forum.					
While you can show a video of how to work with an over locker, it is not guaranteed that the student will develop the tactile ability to effectively problem solve using the tool. It slows down the learning cycle (sometimes learning requires quick mistake-solution iteration).	R9	Implications.	Positive notions.	Problem-solving skills. Teaching methods.	I > 3 I > 6
Depends on the nature of the vocation. It's easier to teach and provide feedback for some disciplines through contact.	R6	Implications.	Feedback F2F.	Lack of participation. Teaching methods.	I > 2 I > 6
There is enormous value in learning within a community of like-minded people. Strong disagree vocational subjects online	R4	Implications.	Positive notions.	Teaching methods.	I > 6
Sometimes it actually takes longer as educators must think about the learning process from a different perspective.	R9	Implications.	Hinder. Time and ease.	Technical difficulties. Time Management.	I > 4 I > 8
Peer-to-peer engagement and support. Anecdotally speaking, students simply do not interact as often as they would in class by quite a large margin.	R9	Implications.	Forums Feedback.	Lack of participation.	I > 2
Enhance interpersonal relationships between the lecturer and individual student. We observe that many students leave their microphones and webcams off. Body language and eye contact is absent. Most interactions are now	R9	Implications. Benefits.	Forums Feedback Self-motivation. Negative notion of perception. Lack of equipment. Time and ease. Online Access. Interpersonal relationships.	Lack of Participation. Lack of Motivation. Technical difficulties. Communication. Collaboration. Engagement.	I > 2 I > 2 I > 4 B > 1 B > 1 B > 1

typed instead of verbal. Students also have poor internet connections so even if they make the effort to engage, communication is often broken and students then prefer communicating by voice only.					
Transcribed Verbatim	Respondent (R)	Main Categories	Preliminary Codes = Sub-categories	Final Codes	Code Allocation
		Development of practices.	Quality of teaching.		
Absolutely agree that navigating e-learning platforms is a skill in itself and student training on this is highly recommended if not absolutely prudential.		Developments	Educator's competencies. Educator's knowledge. Educator's approach. Educator's expertise. Educator's instructional skills. Pedagogical skills. Student IT training.	Teaching methods. Skill development for students.	D > 1 D > 3
Gaining academic knowledge is effective, but requires the facilitator to have strong skills in online pedagogy and e-learning design.	R9	Developments	Educator's competencies. Educator's approach. Quality of teaching.	Educator's Skills and Expertise. Teaching methods. Support and Training.	D > 1 D > 1 D > 2
From experience, I have had students with no prior computer training that have become accustomed to utilising the machine as a tool. I equally believe this can be achieved for online learning if a student is driven and has the correct aptitude.	R6	Developments	Student IT training.	Skill development for students.	D > 3
This platform is stronger suited to independent learning as students often opt for asynchronous learning.	R6	Developments	Asynchronous learning. Educator's approach.	Teaching methods. Learning and teaching styles.	D > 1
Using virtual learning platforms saves a great deal of time in constructing online lessons. Depending on the content of the class it can either complicate	R6	Developments Implications	Educator's competencies. Educator's knowledge. Educator's approach.	Educator's Skills and Expertise. Teaching methods. Support and Training	D > 1 D > 1 D > 2 I > 5

of make the lesson easier. Whereas a virtual learning platform can lend itself to multiples issues (poor internet connection, outdated information, contradictory/false information, steep learning curves for productivity apps/platforms) the age-old contact-based lecture shows up trumps. The virtual learning platform should support not replace a contact modality.			Educator's expertise Educator's instructional skills Pedagogical skills Quality of teaching Internet Connections	Technical difficulties	
Scaffolding of activities is vital in the virtual learning environment. Absolutely. You cannot have an organic process as you would in class. You need to assume that most students will learn asynchronously and then you have to plan that learning journey.	R9	Developments	Educator's competencies. Educator's knowledge. Educator's approach. Educator's expertise. Educator's instructional skills. Pedagogical skills.	Educator's Skills and Expertise Teaching methods Support and training Educator's resources	D > 1 D > 1 D > 2 D > 4
Training, Satisfied. It could have been better, but let's be honest: for these platforms you learn by doing. A basic minimum of navigation and engagement is required and this training was provided.	R9	Developments Implications.	Educator's competencies. Educator's knowledge. Educator's approach. Educator's expertise. Educator's instructional skills Pedagogical skills. Time and Ease	Support and Training. Time management.	D > 3 I > 7
When training is done, they usually conflict with other important deadlines	34 R3	Implications. Developments	Time and Ease. Duties and training deadlines.	Time management. Educator's Skills and Expertise. Support and Training	I > 7 D > 1 D > 2
The time factor precluded in-depth training but there was support.	R2	Implications. Developments	Time and Ease. Duties and training deadlines.	Time management. Educator's Skills and Expertise. Support and Training.	I > 7 D > 1 D > 2

Educator, adequate support from your respective institution in order to effectively use the online learning platforms in the virtual learning environment. Satisfied. It could have been better, because it was assumed that everyone had a reliable high-speed connection and a strong device at home. Luckily, we were able to take work devices home	R9	Developments	Educator's competencies. Educator's knowledge. Educator's approach. Educator's expertise. Educator's instructional skills. Pedagogical skills. Quality of teaching. Duties and training deadlines.	Educator's Skills and Expertise. Teaching methods. Support and Training.	D > 1 D > 1 D > 3
Educator, adequate support from your respective institution in order to effectively use the online learning platforms in the virtual learning environment. The time factor precluded in-depth training but there was support.	R2	Implications. Developments	Time and Ease. Educator's competencies. Educator's approach. Educator's instructional skills. Duties and training deadlines.	Time management. Educator's Skills and Expertise. Teaching methods. Support and Training.	I > 7 D > 1 D > 1 D > 3
Recommendations to the learning program in Fashion Media Studies: Adopt a hybrid learning model. Don't underestimate the power of face-to-face instruction/pedagogy. There's a great need for experiential learning i.e. collaborations with industry. Better open source collaboration apps – all the good apps for work sharing and creative collaboration are few based and outside of scope of students and pinched university budgets. I'm only involved with the higher certificate cohort. I believe that they can benefit from guest speakers and more application of knowledge. More industry collaborations. A strong portfolio of work should be	R9 R8 R7 R4 R1 R2		Educator's competencies. Educator's knowledge. Educator's approach. Educator's instructional skills. Pedagogical skills. Quality of teaching. Duties and training deadlines.	Educator's Skills and Expertise. Teaching methods. Support and Training.	D > 1 D > 1 D > 2



emphasised as a necessity from the onset and not only marked assessments but additional work that students have done in their own time as well.					
Online learning provides an opportunity for collaborative learning and activities for students. It is effective, but requires the facilitator to have strong Skills in online pedagogy and e-learning design.	R9 R1 R2 R3 R7 R9		Educator's competencies. Educator's knowledge. Educator's approach. Educator's instructional skills. Pedagogical skills. Quality of teaching.	Educator's Skills and Expertise. Teaching methods. Support and Training.	D > 1 D > 1 D > 2

## Appendix B: Final coding frame

Positive notion of perception. Self-discovery. Self-motivating. Self-control.	Communication. Collaboration. Engagement.	B>1 B>1 B>1
Positive notion of perception. Problem solving skills. Feedback.	Independent learning skills. IT skills. Training.	B>2 B>3 B>3
Information seeking skills. Social and Cultural knowledge. General or new knowledge. Staying updated. Social skills.	Knowledge creation.	B > 4
Different learning styles. Ease of use.	Diversity. Flexibility.	B > 5 B > 5
Negative notion of perception.	Self-confidence. Confidence in own skills.	I > 1 I > 2
Self-motivation.	Lack of Participation. Lack of Motivation.	I > 3 I > 3
Positive notion of perception. Self-discovery.	Lack of problem solving skills.	I > 4

Self-motivating. Self-control.		
Internet connections.	Technical difficulties.	I > 5
Comprehension.	Different learning styles.	I > 6
Negative notion of perception.	Teaching Methods.	I > 7
Negative notion of perception.	Time management.	I > 8
Development of Practices. Quality of Learning. Positive notion of perception. Educator's competencies. Educator's knowledge. Educator's approach. Educator's expertise. Educator's instructional skills. Pedagogical skills.	Teaching methods. Learning and teaching styles. Educator's Skills and Expertise.	D > 1 D > 2 D > 3
Development of practices.	Quality of teaching.	D > 4
Student IT training.	Skill development for students.	D > 5
Duties and training deadlines.	Student IT training. Skill development for students.	D > 6