

# 21ST CENTURY TEACHER SKILLS: DESIGN PRINCIPLES FOR STUDENT ENGAGEMENT AND SUCCESS

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**ABSTRACT** – Low success rates in first year university modules can lead to lack of progression and reduced student success. One principal reason is that failing some subjects has a greater impact on progression than others. In this study a first year module that was marked as a priority module in the undergraduate BEd course was revised and reconceptualised using pedagogically sound design principles derived from a design-based research approach. The research explains how an institutional intervention plan was replaced by sound module design and innovative teaching in a blended mode to address poor student success in previous years. The design-based research approach led to a number of draft design principles which were tested and refined throughout the presentation of the module in 2019. Besides the design principles, a number of other strategies and ideas led to an extremely positive outcome and greater student success in a module focusing on 21st century teacher skills.

**Keywords:** Preservice Teacher, 21st Century Skills, Learning Technologies

## **INTRODUCTION: THE EVOLUTION OF AN UNDERGRADUATE MODULE – FROM TEACHER TO 21ST CENTURY TEACHER**

Student success has been a priority at many universities worldwide for some time now. The institution where this study was done has taken massive steps to improve student success and is seen as a leading national example of institutional approaches to fostering student success. This has resulted in great gains in terms of student success with module credit success rates moving up by more than 10% over the past 8 years to be above 85% in 2016. Student feedback has also indicated that students are continuously reporting positive perceptions of their experience of their education and the support they receive. Other data have proved to be more worrying. This includes the indications that only approximately 37% of students from the new 2012 cohort completed their qualifications in minimum time (M) and approximately 55% of the same group in minimum time plus one year (M+1). These figures clearly illustrate that the high module credit success rate does not translate into high minimum time completion rates. There are many reasons for the low completion rate. One principal reason is that failing some subjects has a greater impact on progression than others. Major subjects and prerequisites that are failed often lead to an automatic extension of the completion time for a student. In addition to this, many students are not able to take a full course load (or think they can't) because of previous failures which means they are not able to complete their studies as quickly as possible. This aspect of the problem is clearly illustrated by the fact that the actual total course load taken by undergraduate students at the institution amounted to only 82% of the possible course load during 2016. Many students are therefore extending their time to completion which has a number of detrimental effects on them, the institution and on students wishing to enter the system.

An introductory module presented in the first semester of the first year of the new BEd undergraduate programme at our university has had a very interesting beginning. The course design has evolved over the past two years which has had an influence on both the teaching of the content, as well as the way in which the students experience the offering. In 2018, for example, the module (simply named Teaching Studies 1A) was presented by a team of six lecturers who divided up the teaching load with meticulous detail. Lecturer teaching load per week was meticulously calculated according to individual workloads, and lecturers were allocated segments of the proposed content to present over the 14-week period of the module. The seemingly random allocation of lecturers came from a single department within the Faculty of Education, namely the Department of Science and Technology Education but there was still no real sense of unity. Lecturer expertise included Science Education (the coordinator), Mathematics Education (two colleagues), Learning Technologies, as well as Technology Education (two colleagues). These

lecturers did not, however, teach their own subject specialities, but rather focused on the more generic roles that a young teacher should play.

Focusing on the roles of the teacher, the module claimed to offer an introduction to the teaching profession and what it would take to be a successful teacher in the modern age. The ultimate aim of the module was, of course, professional development of the pre-service teacher. The broad topics covered in this module roughly followed the chapters in the prescribed e-textbook (Gravett, De Beer & Du Plessis, 2014) and included the following roles of the teacher: The teacher as caring professional, the teacher as reflective practitioner, the teacher as mediator of learning, the teacher as classroom manager, the teacher as curriculum interpreter, designer and implementer, the teacher as educational theorist, the teacher as assessor, and the teacher as user of media. According to Sahlberg (2004), globalisation is reshaping the role, purpose, process and ultimately the outcomes of teaching, learning and assessment. As a result the demand for a highly qualified and competent teaching force has become central to education reform. One of the by-products of globalization is the growing expectation of teachers to prepare, empower and equip students to achieve and reach their full potential which would allow them to become active and valuable members of a 21st century society who “have the opportunity to shape the fourth industrial revolution” (Schwab, 2017). The ever changing nature and variety of these expectations mean that teachers, more than ever before, must be able and equipped to make decisions based on a logical, robust and updated foundation of knowledge.

In 2018, the module coordinator took on the teaching load over four weeks, along with one other colleague taking on the same load. Another colleague taught for three weeks, and the remaining three colleagues each did a cameo appearance of one week each. Each weekly session included a double period lasting roughly one and a half hours. The 540 students were also divided up between the lecturers for assessment purposes (excluding the coordinator) with the highest number of students to assess being 216, with the second most being 162, and the other three colleagues having to mark 54 each. This only applied to the final written assessment as the rest of the formative assessment tasks were all in an online quiz format which was marked by the electronic learning platform (BlackBoard).

The online component of the module in 2018 not only included the electronic quizzes but also made use of the other basic functionalities of the BlackBoard platform like announcements and discussions. Details of the face-to-face contact sessions were also posted online along with some supporting materials, including links to relevant resources and web sites.

### **IDENTIFYING THE PROBLEM**

The institutional aim is to set minimum requirements for student success activities as well as provide optional additional activities; to strengthen data analytics and data-informed decision-making with regard to student success by identifying problem areas and blockages; to track student performance and ensure that students complete qualifications as efficiently and timeously as possible. The approach involves both faculties and professional support services and includes a variety of tailor-made interventions to promote student success.

As early as February 2018, a Faculty Intervention Plan was put into place to address feedback from students and tutors at that point. The feedback indicated that many students do not have personal devices. For this reason, amongst others, students experienced difficulty downloading the e-textbook while others found it difficult to adapt to the new academic environment within the first few months. The online environment was also seen as huge adaptation for some students. The need for BlackBoard training was identified as well as the need for more tutors and more appropriate venues for tutorials (the dedicated tutor room which is used by all education students at various levels was deemed to be inappropriate for this function). To compound student problems, the examination paper had been scheduled on the last Friday of the examination period during the afternoon session.

In September 2018, this module was identified as being part of the 20% of modules where the most first time enrolments were lost, due to a variety of reasons. This 20% of priority modules is selected by incorporating the number of students registered in a module; the module pass rate

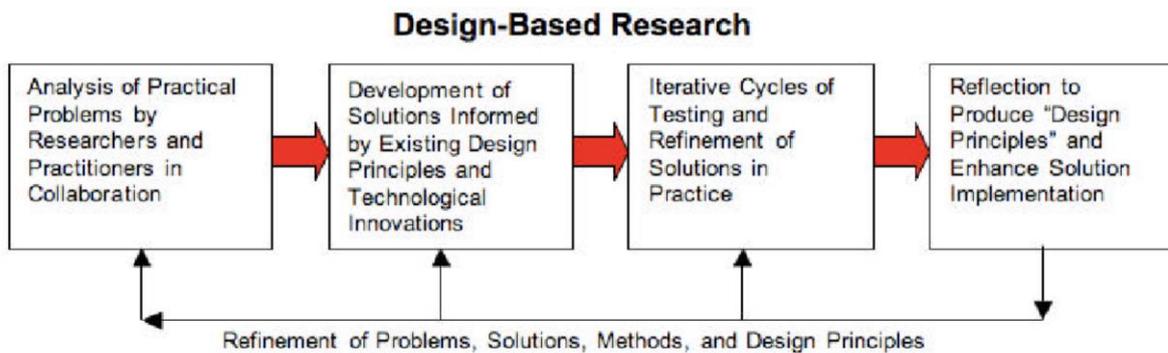
and the module's first time enrolment weighting (FTE) into a formula which then produces the Priority Module Index (PMI) list. The data from the PMI was previously used to inform the Intensive Revision Programme at the university, but with this more strongly data informed approach, the value and use of the PMI has been deepened and expanded. The PMI is now drawn in the semester preceding the re-offering of the modules (for example, the first semester 2018 PMI was used to guide the first semester 2019 interventions). Out of 494 students in the 2018 cohort who completed the module, 64 failed. A number of issues that have already been mentioned in the introduction are problematic in themselves and have played a role in this phenomenon. Students experienced a number of issues, including the large number of lecturers who engaged with them during contact sessions, a seemingly disjointed curriculum, and lecturers who played a role but had no real ownership of the sections they taught. Having several lecturers (eight in 2017 and six in 2018) to facilitate the content was not the ideal situation.

As part of the university intervention programme, a revision intervention was planned for the June holiday before the supplementary examinations to assist students who underperformed in the module. Resource materials were made available online via BlackBoard for additional revision and for students choosing not to attend these sessions. Unfortunately, while the plan was rather detailed and specific, very little happened by way of implementation. One workshop was arranged in the end. For this reason, a plan had to be made for the 2019 intake to prevent the mistakes of the past. We also had to ensure that creativity and technology were infused into an authentic 21st century educational experience (Herikson, Mishra & Fisser, 2016).

After a few meetings with the coordinator of the academic intervention programme it was decided that we could go ahead with our own intervention based on the strategy described in the preceding text. We felt that it was difficult to see a place for an "outside" intervention in our module without having the opportunity to first try our research-driven approach. Fortunately, our request was well-received and we were able to implement the changes based on sound pedagogical design. This plan involved a complete redesign of the module to incorporate elements of best practice in both the online and face-to-face spaces. In order to do this it would be necessary to derive a number of design principles that would ensure student success in this blended space and to implement the draft design in 2019.

#### **METHODOLOGY: DERIVING AND IMPLEMENTING APPROPRIATE DESIGN PRINCIPLES IN A BLENDED MODE MODULE FOR FIRST YEAR 21ST CENTURY TEACHING STUDENTS**

Design-based research, originally conceptualized under the guise of design experiments (Brown, 1992; Collins, 1992; Reeves, 2000), development research (Reeves, 2000; Van den Akker, 1999) or design research (Bannan-Ritland, 2003; The Design-based Research Collective, 2003; Kelly 2003; O'Donnell 2004;) was selected to address the goals of this project. Educational design research, according to Reeves, McKenney and Herrington (2011) "provides a potentially viable alternative to the kind of educational research that is commonly conducted in the field of learning technology." In my quest to remain relevant through this research, I chose to solve a practical problem in my own teaching (the issue of student success in a blended mode module) while simultaneously "constructing a body of design principles that can guide future development efforts" (Reeves, McKenney & Herrington, 2011). Pedagogic design should be grounded in theory and theory driven (Barab & Squire, 2004). To achieve this aim, I set out to explore the pedagogic complexities of incorporating learning technologies and twenty-first century skills into an undergraduate pre-service teacher module that focuses on teaching in the 21st century.



**Figure 1: Design-based Research according to Herrington, McKenney, Reeves and Oliver (2007)**

As suggested in the first phase of the design logic presented in Figure 1, this study began with an in-depth investigation involving discussions with the key role players in the study (McKenney & Reeves, 2018). These role players included the previous teaching staff, the students, and the tutors. Also included in the mix was the coordinator of the university intervention program from the Academic Development Centre (ADC) who made the profound statement that “I also want to draw your attention to the fact that of all the modules in Education, this one is the best opportunity we have to make a noticeable impact on student success.” Some of the initial draft design principles for the 2019 blended module came from early interactions with key individuals in the ADC and from their policies and guidelines. Design principles from these sources that were most relevant to this module included:

- Gain the support of top management at Institutional, Faculty and Divisional level
- Put into place appropriate and effective Institutional and Faculty structures to support the implementation and to evaluate student success efforts in these domains
- Elicit participation and involvement by all relevant staff to ensure maximum efficacy
- Focus on student success related data analytics and data informed decision-making processes at the institution
- Provide effective and expanded online support (the online component was redesigned to incorporate elements of good online pedagogical design)
- Optimise resources to support student success at all levels
- Initiate inter-divisional partnerships to enhance student success (in this regard we partnered with the Academic Development Centre as well as with the Centre for Academic Technologies)
- Use student success efforts to influence what happens in the classroom (this is a key space for improving student success and in implementing effective interventions)

Through further surveys and interventions run by the Academic Development Centre (ADC) I was also able to interpret data which portrayed the voices of both students and tutors. From this data, and supported by focused reading in a variety of fields including pedagogical design, the fourth industrial revolution, 21st century teaching, and learning technologies (during the second phase in Figure 1), I was able to distil further draft design principles to guide the design of the new iteration of the module in 2019. The focused reading to discover further design principles for blended teaching approaches added to personal entrenched principles that have developed over my many years of teaching. Most of the design principles were, in fact, derived from my personal experience as facilitator of fully online modules at the university (and that of my fellow online lecturers). Most of the draft design principles used in the re-design of the new module for 2019 were common sense principles that should work in the design of any generic undergraduate module. Logically, the first iteration of the 2019 teaching was based on some theoretically grounded principles, some principles derived from the literature, principles derived from experiences of fellow lecturers, and some personal preferences and intuition based on recent experiences of teaching fully online modules.

Some of these early draft design principles include:

- Match the assessment strategy during the semester with the final summative assessment - Previously the module made use of a continuous assessment model, which relied on online quiz format using mostly multiple choice type questions. The exam was, by contrast, a written exam consisting of short and long questions. Learning Development will assist the module-coordinator with informing students of how to prepare for an exam.
- Increase student attendance of the face-to-face sessions by making them a meaningful part of the learning process
- Conceptualise face-to-face sessions based on sound pedagogical principles and supported by well-designed online units in BlackBoard.
- Ensure that the online components are engaging and challenging to ensure that students see value in them
- Use the class tests as opportunities to teach both content and practical skills related to the online system
- Provide well trained and motivated tutors to run the face-to-face tutorial sessions
- Arrange for dedicated tutorial spaces and times on the official timetable
- Minimise the number of lecturers who engage with the students to ensure ownership and building of relationships

The eight learning units were released strategically and sequentially to allow for design and re-design of subsequent units based on our learning during each iteration. In other words, after unit one we re-designed based on what we had learned and then set up unit two with revised design principles. Each unit could not remain as it was previously and a concerted effort was made to include content related to technologies that can play a role in the everyday functioning of the 21st century teacher. Some draft design principles related to learning technologies and the role of the 21st century teacher include:

- Remain relevant at all times
- Provide content that is meaningful (authentic) and up to date
- Include scenarios that engage students about the future
- Provide a variety of possible tools, services and Apps that can be used for each role of the teacher in the 21st century
- Allow for student choice regarding which tools, services and Apps they can use

Naturally, the design principles evolved as the units progressed and were refined accordingly after each iteration.

## **FINDINGS AND DISCUSSION: DESIGN PRINCIPLES FOR STUDENT SUCCESS**

Firstly, the initiative to take over and re-vamp the module was taken on by a single division of the Department of Science and Technology Education within the Faculty of Education. This Learning Technologies Unit (LTU) has been largely successful in giving the module an identity and a conceptual “home”. By putting a distinctive learning technology slant to the module it has been an easy transition to remain current and address issues that lead students into the fourth industrial revolution (4IR). The 21st century skills topic has also ensured that students are not simply focusing on teaching in general, but also on the skills and tools needed to succeed in their future teaching. For this reason, a future oriented approach which focuses on what teaching “could be” has also been found to be engaging and relevant for the students. By focusing on redesigning the module content, and including detail on the teacher in the 21st century in all units, we provided a fresh focus that aligns well with the notion of the teacher in the 4IR.

By reducing the lecturer numbers from seven to three, and by ensuring that they all came from a single division at the university, we have further strengthened the identity of the module as a topical and relevant experience. Students appear to be more eager and willing to engage with the revised topics that seem to be more meaningful to them than before. Students seem to appreciate the more structured approach, along with the more meaningful subject matter, and are also happier with the relationships that can be built with the reduced number of lecturers.

The new module coordinator along with the lecturing team have reconceptualised the online component to include relevant content and additional reading and exercises for students at all “levels”. The units appear to include a lot of content online but there are always students who need to be stretched a little with additional engagement. It is our feeling that this “extra” content may inspire those students who normally do the bare minimum to get more involved. Content includes text, journal articles, links to web sites, downloaded content, videos, and graphics. As mentioned before, each unit now also includes 21st century skills and technologies that can be used by the teacher in the 4IR, with a focus on tools, Apps and online services.

A consistent assessment approach was implemented throughout the 2019 intervention to address previous problems related to assessment. The assessment strategy this year included a revised and updated online quiz format. This format was replicated in the online examination that mirrors the online multiple choice tests that were implemented after each unit. The only difference between the tests and the examination was that the examination was held in a computer venue under supervision. Test banks (pools) were compiled for this function and questions were randomly selected from the pools in each of the four examination sections. Each section had 25 random questions from the pools. The four sections were created to prevent the loss of all work due to student errors or system failure on the day of the examination. It was also done to allow students to submit sections randomly to reduce strain on the network. The consistent approach to assessment was well-received and also reduced the stressful task of physical marking for the lecturers. This does not mean that there is no work to be done. On the contrary, the setup of the online quiz takes a long time and will constantly need to grow and improve. The only difference here is that the lecturer will do the work before the assessment rather than after.

A teaching evaluation and a module evaluation done by independent institutional researchers on this priority module has provided positive feedback in all regards. The only aspect that needs to be tightened up in the next year is the provision of more adequate feedback in the online assessments to facilitate learning as well as additional practice for the online quiz section.

The draft design principles briefly mentioned in this article will now be refined and tested once again in the new intake in 2020. The DBR process continues and ultimately I will go back to theory again to verify certain design principles or to suggest new contributions to theory in a specific context. Through this process, I have also attempted to address the notion of socially responsible research (Reeves 2000; Reeves, Herrington & Oliver, 2005) by addressing the quality of pre-service teacher training, especially those problems related to teaching and learning in the 21st century and teacher development in general. The technological tools and 21st century skills that are needed in the 4IR also receive the necessary attention. For this reason, in this study there is potential to make a contribution to both educational theory and teaching practice. More importantly, this can be seen as meaningful research that is socially responsible, with a high theoretical and practical value. This is not only socially responsible research but also “educationally relevant research” (Reeves, McKenney & Herrington, 2011).

## REFERENCES

- Bannan-Ritland, B. (2003). The role of design in research: The integrative learning design framework. *Educational Researcher*, 32 (1), 21-24.
- Barab, S., & Squire, K. (2004). Design-Based Research: Putting a Stake in the Ground. *The Journal of Learning Sciences*, 13(1), 1-14.
- Brown, A.L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences*, 2(2), 141-178.
- Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O’Shea (Eds.), *New directions in educational technology*. (pp. 15-22). Berlin: Springer-Verlag.
- Gravett, S., De Beer, J.J. & Du Plessis, E. (Eds.). (2014). *Becoming a Teacher*. (2nd ed.). Cape Town: Pearson.
- Henriksen, D., Mishra, P., & Fisser, P. (2016). Infusing Creativity and Technology in 21st Century Education: A Systemic View for Change. *Journal of Educational Technology & Society*, 19(3).
- Herrington, J., McKenney, S., Reeves, T.C., & Oliver, R. (2007). *Design-based research and doctoral students: Guidelines for preparing a dissertation proposal*. In C. Montgomerie & J. Seale (Eds.),

Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications. pp. 4089-4097. Chesapeake, VA: AACE.

Kelly, A. E. (2003). Theme Issue: The role of design in educational research. *Educational Researcher*, 32(1), 3-4.

McKenney, S., & Reeves, T.C. (2018). *Conducting educational design research*: Routledge.

O'Donnell, A. M. (2004). A commentary on design research. *Educational Psychologist*, 39(4), 255-260.

Reeves, T.C. (2000). *Enhancing the Worth of Instructional Technology Research through "Design Experiments" and Other Development Research Strategies*. Paper presented at the Symposium on international perspectives on instructional technology research for the 21st century, New Orleans, LA, USA.

Reeves, T.C., Herrington, J., & Oliver, R. (2005). Design research: A socially responsible approach to instructional technology research in higher education. *Journal of Computing in Higher Education*, 16(2), 97-116.

Reeves, T.C., McKenney, S., & Herrington, J. (2011). Publishing and perishing: The critical importance of educational design research. *Australasian Journal of Educational Technology*, 27(1), 55-65.

Sahlberg, P. (2004). Teaching and globalization. *Managing Global Transitions*, 2(1), 65.

Schwab, K. (2017). *The fourth industrial revolution*: Penguin, UK.

The Design-based Research Collective. (2003). Design-Based Research: an emerging paradigm for educational inquiry. *Educational researcher*, 31(1), 5-8.

Van den Akker, J. (1999). Principles and methods of development research. In *Design approaches and tools in education and training* (pp. 1-14): Springer.