



## Digital Curricular Transformation and Fourth Industrial Revolution 4.0 (4IR): Deepening Divides or Building Bridges

Orhe Arek-Bawa<sup>1</sup> , Sarasvathie Reddy<sup>1</sup> 

<sup>1</sup> School of Education, University of KwaZulu-Natal, Durban, South Africa.

### ABSTRACT

As the COVID-19 pandemic brought the world to a standstill, many traditional contact higher education institutions, such as the University of KwaZulu-Natal (UKZN), embraced the technologies of the Fourth Industrial Revolution (4IR) to pursue their mandates. Such transitions necessitate transforming existing curricula into digitised versions that infuse digital technologies into programme delivery and embed digital learning experiences students need to thrive in the 4IR workplace. However, two years into online education, the extent to which the Bachelor of Education (B.Ed) curriculum in the School of Education (SoE) at UKZN integrates digital technologies in programme offerings remain largely uncertain. This article therefore aims to ascertain how the B.Ed curriculum of the SoE has been digitally transformed to support the production of teachers who are prepared for the 4IR classroom. It further explores whether or not the digital curriculum transformation of the B.Ed curriculum deepens the existing digital divide amongst students or builds bridges for digital learning. Stufflebeam's context, input, process, and product (CIPP) model was relied upon to appreciate students' digital learning experiences through a qualitative content review of twelve curriculum templates and moderation reports. The findings suggested varied learning experiences of content and digital skills for students who engaged with the digital B.Ed curriculum while pointing to a possible epistemological limitation for some students due the contextual digital divide. Insights from this article will be helpful to academics and the institution in their quest to produce graduates for the 4IR classroom while making a timeous contribution to the scholarship of teaching and learning to enhance sustainable post-COVID-19 pedagogical practices.

Correspondence

Orhe Arek-Bawa

Email: [arekbawao@ukzn.ac.za](mailto:arekbawao@ukzn.ac.za)

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### INTRODUCTION

Central to the continued digital transformation associated with the 4IR is the need for education to produce the workforce to drive and implement the unfolding change. To do this, Higher Education Institutions (HEIs) globally have to adapt and rethink their educational strategies and objectives,

strengthen their digital base, amend their curricula to incorporate new content, and modify pedagogical approaches.<sup>1</sup> Catalysed by the COVID-19 pandemic, place-based (face-to-face) institutions like UKZN transitioned to remote online education overnight,<sup>2</sup> necessitating a digitalised curriculum.<sup>3</sup> Gagnon et al. describe a fully digitised curriculum as an effective alignment of curricula and technology with pedagogy that reflects and furthers "deep, active, discovery-based, collaborative and problem-based" learning.<sup>4</sup>

These learning experiences are similar to the high-quality curricular expectations of Education 4.0 (allied to 4IR) that transits passive forms of learning to interactive forms aimed at stimulating critical and individual thinking.<sup>5</sup> In the face of the global lockdown, UKZN built the capacity of the university community through workshops to prepare them for online teaching and learning. With the help of the South African Department of Higher Education, HEIs such as UKZN provided staff and students with data bundles/zero-rated data applicable to the institutions' websites and libraries to ensure uninterrupted connectivity. Academics in UKZN, therefore, navigated digital platforms such as Zoom, Microsoft Teams, Google classroom and the learning management system – Moodle to further their pedagogical practices. They developed emergency online remote learning templates that served as the remote curricula to guide teaching and learning across the institution, including the SoE. However, it remains unclear how the curriculum adopted in the online learning journey enabled students with the requisite skills and knowledge fit for the future in a digitised world.

Moreover, literature reveals that online learning exacerbated the inequalities in the South African schooling system and the disparity in educational outcomes for many students.<sup>6</sup> Schools are divided into five categories, referred to as quintiles ranging from quintiles 1 to 5.<sup>7</sup> Quintiles refer to the ranking of schools that are based on weighted poverty indicators, including the income level of the community where the school is located.<sup>8</sup> UKZN draws its students from mainly quintiles 1 and 2 schools, and thus, the students are at the bottom end of the unequal education spectrum. Plagued with uncondusive home environments, unreliable cell phone networks and load shedding, to name a few causes for the disruption of learning, scholars have questioned the extent to which the digital

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<sup>1</sup> Vuyisile Msila, *Digitalization and Decolonizing Education: A Qualitative Study of University of South Africa (UNISA) Leadership*, 2021; World Economic Forum, "Schools of the Future Defining New Models of Education for the Fourth Industrial Revolution" (Geneva, January 2020); Gloria Castrillon and Kirti Menon, "Reimagining Curricula for the Fourth Industrial Revolution," *The Independent Journal of Teaching and Learning* 4, no. 2 (2019).

<sup>2</sup> Orhe Arek-Bawa and Sarasvathie Reddy, "Blending Digital and Technological Skills with Traditional Commerce Education Knowledge in Preparation for the 4IR Classroom: The COVID 19 Catalyst," *Alternation African Scholarship Book Series (AASBS)*, 2020.

<sup>3</sup> Simon Bheki Khoza and Cedric Bheki Mpungose, "Digitalised Curriculum to the Rescue of a Higher Education Institution," *African Identities*, September 14, 2020, 1–21, <https://doi.org/10.1080/14725843.2020.1815517>.

<sup>4</sup> Paul Gagnon, Jan Carlstedt-Duke, and Nabil Zary, "Key Aspects to the Design, Development, Deployment and Evaluation of a Fully Digitised Undergraduate Programme," 2019, 5821–30, <https://doi.org/10.21125/edulearn.2019.1408>.

<sup>5</sup> World Economic Forum, "Schools of the Future Defining New Models of Education for the Fourth Industrial Revolution."

<sup>6</sup> Laura Dison et al., "Reframing Purpose and Conceptions of Success for a Post-Covid-19 South African Higher Education," *Scholarship of Teaching and Learning in the South* 6, no. 1 (April 29, 2022): 33–54, <https://doi.org/10.36615/sotls.v6i1.222>; Shireen Motala and Kirti Menon, "Pedagogical Continuities in Teaching and Learning during COVID-19: Holding up the Bridge," *Scholarship of Teaching and Learning in the South* 6, no. 1 (April 29, 2022): 7–32, <https://doi.org/10.36615/sotls.v6i1.249>. J.D. Jansen, "What does it mean to Teach in the Shadow of COVID-19? A Critical Reflective Essay on the Future of Online Teaching in South African Universities." *Alternation African Scholarship Book Series (AASBS)*, (2021):132.

<sup>7</sup> Katharine Hall and Sonja Giese, "Addressing Quality through School Fees and School Funding," 2009, <https://open.uct.ac.za/handle/11427/3988>.

<sup>8</sup> S. Dass and A. Rinquest, School fees. *Basic education rights handbook: Education rights in South Africa. Johannesburg, South Africa: SECTION 27* (2017). <http://section27.org.za/wpcontent/uploads/2017/02>.

curriculum aided or widened the epistemological gap and digital divide in the South African higher education landscape.<sup>9</sup>

Against this backdrop, the paper sought to respond to the following research questions: 1) To what extent has the B.Ed curriculum of the SoE been digitally transformed to support the production of graduate teachers who are prepared for the 4IR classroom? 2) Does the digital B.Ed curriculum deepen the existing digital divide amongst the SoE students or build bridges for digital learning required for the 4IR classroom? Stufflebeam's CIPP model formed the framework through which twelve module templates and corresponding moderator's assessment reports were reviewed to produce data in response to the above research questions. What follows is a presentation of current literature that pertains to digital curricular transformation, the requirements for the move into the 4IR and an outline of the existing digital divide amongst South African students. An explanation of the CIPP model and how it was engaged in the analysis of the module templates and moderator reports follows. Then the research methodological issues are presented, followed by the findings and discussion. The paper concludes by highlighting the core issues observed from the findings and offers some recommendations for how a socially just digital curriculum transformation process should proceed, bearing in mind the attributes that are required for the 4IR.

## LITERATURE REVIEW

### Digital Curricular Transformation

The transformation of the higher education curriculum has been a topical issue in South Africa since the dawn of democracy. The need to redress the imbalances of the past premised on the *Education White Paper 3* was a key driver for curriculum reforms in the nineties.<sup>10</sup> Curricular transformation is intended to be ongoing as HEIs respond to local and international societal demands.<sup>11</sup> Of late, the "fees must fall protest" that rocked the HEIs in 2015 and 2016 re-ignited the focus of many scholars on decolonising the curriculum.<sup>12</sup> While this remains a relevant discussion to stimulate homogenous education,<sup>13</sup> the COVID-19 pandemic has escalated a digital transformation agenda in HEIs, that this chapter foregrounds.

In light of the 4IR, curriculum transformation is required to incorporate digital technologies and other cross-functional skills (critical and analytical thinking, problem-solving, collaborative and interpersonal, creative and innovative thinking, to name a few) to prepare students for employment and to be global citizens.<sup>14</sup> Termed a digitalised curriculum, Khoza and Mpungose describe it as a "plan for and/or a plan of teaching, learning and research, driven by specific hardware, software, and

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<sup>9</sup> Jansen, "What does it mean to Teach in the Shadow of COVID-19?"; Petro Du Preez and Lesley Le Grange, "The COVID-19 Pandemic, Online Teaching/ Learning, the Digital Divide, and Epistemological Access," 2020.

<sup>10</sup> Department of Education, "Education White Paper 3: A Programme for the Transformation of Higher Education," *South African Government Gazette* 390, no. 18515 (1997): 390–18515.

<sup>11</sup> Lesley Le Grange, "Decolonising the University Curriculum: The What, Why and How," *South African Journal of Higher Education* 30, no. 2 (June 2016): 216–33, <https://doi.org/10.20853/30-2-709>.

<sup>12</sup> Jonathan Janes, *Decolonisation in Universities: The Politics of Knowledge* (NY: NYU Press, 2019); Lesley Le Grange et al., "Decolonising the University Curriculum or Decolonial-Washing? A Multiple Case Study," *Journal of Education*, no. 80 (2020), <https://doi.org/10.17159/2520-9868/i80a02>; Le Grange, "Decolonising the University Curriculum: The What, Why and How"; E. O. Anwana, "Decolonising the Law Curricula at Universities of Technology: Students' Perspective on Content," *South African Journal of Higher Education* 36, no. 1 (2022): 59–75, <https://doi.org/10.20853/36-1-4067>; Pryah Mahabeer, "Curriculum Decision-Makers on Decolonising the Teacher Education Curriculum," *South African Journal of Education* 38, no. 4 (November 30, 2018): 1–13, <https://doi.org/10.15700/saje.v38n4a1705>; Kehdinga George Fomunyan, "Decolonising the Future in the Untransformed Present in South African Higher Education," *Perspectives in Education* 35, no. 2 (2017), <https://doi.org/10.18820/2519593X/pie.v35i2.13>.

<sup>13</sup> Sakhisendi Yende, "Performing Arts: A Case Study on Curriculum Transformation," *The Independent Journal of Teaching and Learning* 6, no. 1 (2021): 129–41.

<sup>14</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the fourth industrial revolution*; Yende, "Performing arts: a case study on curriculum transformation."

theories"<sup>15</sup> The digitalised curriculum should facilitate digital competence<sup>16</sup>, that enables students to engage with "digital technologies in a critical, collaborative and creative way."<sup>17</sup>

According to Khoza and Mpungose, the digitalised curriculum is dominated by two strands - a performance-based curriculum and a competency-based one. The authors contend that the key principles of a performance-based curriculum include prescribed content with a stipulated instructional timeframe, set objectives, learning support materials, and assessments.<sup>18</sup> It is premised on the traditional model of education that promotes passive forms of learning focusing on direct instruction and mastering the content mainly through memorisation.<sup>19</sup>

The competency-based curriculum stems from an integrative, progressive education model with limited content specification and loose disciplinary boundaries, fostering learner independence from reflective practices.<sup>20</sup> This curriculum is tailored toward producing cross-functional skills required in the current and future workplace.<sup>21</sup> The key principles of a competency-based curriculum include "learning activities, outcomes, facilitation, learning community and distance learning."<sup>22</sup> This interactive model allows academics to facilitate learning using various means, including online platforms, to promote collaborative learning in a communal space.<sup>23</sup> Considering the principles of both models, it would appear that the competency-based curriculum is better suited to advance skills expectations of the 4IR, as confirmed by Chisholm in her study on the postgraduate pharmacy programme.<sup>24</sup> Drawing from the principles of the performance- and competency-based curriculum, the authors of this article, reviewed selected module templates of the B.Ed curriculum to ascertain the extent to which the learning experiences prepared students for their future digitised classrooms. Description of module aims / learning outcomes, content, mode of delivery, teaching approaches and assessments gleaned from the curriculum templates were examined to determine the extent to which the planned learning experiences facilitated passive forms of learning or interactive / collaborative engagements. The former suggests a performance-based curriculum while the latter indicates a competency-based one.

### The 4IR classroom

In the 4IR classroom, the integration with technology can be seen in "the use of knowledge transfers such as platforms, learning materials, classroom settings, learning space, knowledge presentation and

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<sup>15</sup> Khoza & Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1.

<sup>16</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the fourth industrial revolution*.

<sup>17</sup> European Commission, "European Digital Competence Framework for Citizens (DigComp)," <https://esco.ec.europa.eu/en/escopedia/european-digital-competence-framework-citizens-digcomp>, 2016.

<sup>18</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21.

<sup>19</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the fourth industrial revolution*; Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; World Economic Forum. *The future of jobs reports 2020*. (Geneva, Switzerland: World Economic Forum, 2020).

<sup>20</sup> Johan Muller and Ursula Hoadley, "Curriculum Reform and Learner Performance: An Obstinate Paradox in the Quest for Equality," in *South African Schooling: The Enigma of Inequality* (Cham: Springer International Publishing, 2019), 109–25, [https://doi.org/10.1007/978-3-030-18811-5\\_6](https://doi.org/10.1007/978-3-030-18811-5_6); Sioux McKenna, "Paradigms of Curriculum Design: Implications for South African Educators," *Journal for Language Teaching* 37, no. 2 (January 27, 2004), <https://doi.org/10.4314/jlt.v37i2.6016>.

<sup>21</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21.

<sup>22</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 7.

<sup>23</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; McKenna, "Paradigms of curriculum design: Implications for South African Educators." ; Orin Chisholm, "Curriculum Transformation: From Didactic to Competency-Based Programs in Pharmaceutical Medicine," *Frontiers in Pharmacology* 10 (March 21, 2019), 278 <https://doi.org/10.3389/fphar.2019.00278>.

<sup>24</sup> Chisholm, "Curriculum transformation: from didactic to competency-based programs in Pharmaceutical Medicine."

more."<sup>25</sup> It is an interactive and engaging classroom where the internet is in use, and technology integration can be through e-learning, MOOCs or blended learning.<sup>26</sup> Since the 4IR requires individuals with data and digital skills, students need to acquire digital literacy during their studies, even though they are digital natives.<sup>27</sup> As such, the B.Ed curriculum in SoE should incorporate experiences that will equip future teachers with relevant Technological Pedagogical and Content Knowledge (TPACK) and cross-functional skills to facilitate quality learning effectively. The extent to which this happens in the B.Ed curriculum is presented in the findings section of this article.

### Cross-functional skills

Besides technical subject matter expertise and digital technological skills, the talents that the 4IR graduates are expected to possess are other cross-functional skills, of which critical thinking, creativity and innovation, complex problem-solving, and interpersonal skills are widely acknowledged.<sup>28</sup> Complex problem-solving skills premised on problem-based learning may be described as the ability to proffer novel solutions to complex, ill-defined real-world issues.<sup>29</sup> Students exhibit complex problem-solving skills when they can work through unstructured, messy, complex real-life scenarios to develop plausible solutions.<sup>30</sup> In the process, they exhibit innovative and creative tendencies. To Bonk and Smith, an original idea that addresses a problem implies using creative thinking skills. Such novel ideas often emanate from critical thought, which was described as the capacity to assess situations using logical reasoning or approaches. While creativity results in diverse plausible solutions, critical thinking is employed in choosing the solution, thus enabling sound judgment.<sup>31</sup> Interpersonal and collaborative skills foster healthy relationships to communicate and persuade others in a globally diverse environment.<sup>32</sup> It is worth noting that these attributes are associated with higher-order thinking and soft skills that are less likely to be automated in our digital age.<sup>33</sup>

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<sup>25</sup> Hussein M. Alakrash and N. A. Razak, "Redesigning the English Classroom To-Wards Fourth Industrial Revolution, Are the Students Motivated?," *The Asian ESP Journal* 16 (2020): 6–21.

<sup>26</sup> Alakrash and Razak, "Redesigning the English Classroom towards Fourth Industrial Revolution, Are the Students Motivated?" 7; Candradewi Wahyu Anggraeni, "Promoting Education 4.0 in English for Survival Class: What Are the Challenges?," *Metathesis: Journal of English Language, Literature, and Teaching* 2, no. 1 (May 3, 2018): 12, <https://doi.org/10.31002/metathesis.v2i1.676>.

<sup>27</sup> Alakrash and Razak, "Redesigning the English Classroom towards Fourth Industrial Revolution, Are the Students Motivated?" 7.; Anggraeni, "Promoting education 4.0 in English for survival class"12.

<sup>28</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the fourth industrial revolution*; Menon, and Castrillón, "Reimagining curricula for the Fourth Industrial Revolution."6-19.

<sup>29</sup> World Economic Forum, "Schools of the Future Defining New Models of Education for the Fourth Industrial Revolution."

<sup>30</sup> Gyöngyvér Molnár, "The Use of Innovative Tools in Teacher Education: A Case Study," in *The Fifth International Conference on Informatics, Educational Technology and New Media In education* (AD Novi Sad, 2002), 44–49; Stuart H. Jones and Michael Wright, "Effect of Cognitive Style on Performance in Introductory Financial Accounting and the Decision to Major in Accounting," *Global Perspectives on Accounting Education* 8 (2011): 7–26.

<sup>31</sup> Curtis Jay Bonk and G Stevenson Smith, "Alternative Instructional Strategies for Creative and Critical Thinking in the Accounting Curriculum," *Journal of Accounting Education* 16, no. 2 (August 1998): 261–93, [https://doi.org/10.1016/S0748-5751\(98\)00012-8](https://doi.org/10.1016/S0748-5751(98)00012-8).

<sup>32</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the fourth industrial revolution*.

<sup>33</sup> Timothy Teo et al., "Initial Teacher Training for Twenty-First Century Skills in the Fourth Industrial Revolution (IR 4.0): A Scoping Review," *Computers & Education* 170 (September 2021): 104223, <https://doi.org/10.1016/j.compedu.2021.104223>; Arek-Bawa and Reddy, "Blending Digital and Technological Skills with Traditional Commerce Education Knowledge in Preparation for the 4IR Classroom: The COVID 19 Catalyst"; Anne Virtanen and Päivi Tynjälä, "Factors Explaining the Learning of Generic Skills: A Study of University Students' Experiences," *Teaching in Higher Education* 24, no. 7 (October 3, 2019): 880–94, <https://doi.org/10.1080/13562517.2018.1515195>; Lorin W Anderson et al., *Taxonomy For\_ Assessing a Revision OF Bloom'S Taxonomy OF Educational Objectives* (Longman, 2001).

Developing cross-functional skills in students has attracted scholars' attention for many years.<sup>34</sup> Popular strategies suggested by these scholars for developing cross-functional skills were predominantly learner-centred as they emanate from active learning styles. They include problem-based learning, questioning, collaborative and interactive learning, case studies, self-reflective journals, and blended learning. In this research, the pedagogical practices of academics in the SoE, as depicted in the module templates, were examined to determine the extent to which they enable the development of students' cross-functional skills in preparation for the 4IR classroom amid a digital divide prevalent in the South African education context.<sup>35</sup>

### Digital divide

The abrupt transmission to online learning in the South African HEIs foregrounded the digital divide between students along socioeconomic lines.<sup>36</sup> In the heart of the lockdown, when students were mandated to vacate their residences, some returned to conducive accommodation with access to internet connectivity, while others left their university residences to overcrowded homes in the townships and farms with limited network services.<sup>37</sup> Although the current generation of students is generally regarded as digital natives, some from more affluent homes are more familiar with technological devices and digital learning than others.<sup>38</sup> Given that most of the students in the SoE come from schools in the lower quintiles,<sup>39</sup> it remains unclear how the enacted digitalised curriculum afforded students epistemological access amid the digital divide. This motivated us to conduct the current study on which the article is based.

### CIPP framework

Stufflebeam's Context, Input, Process, and Product (CIPP) model is widely used in curriculum review.<sup>40</sup> The model was designed in the late sixties to enhance education programmes' accountability

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<sup>34</sup> Teo et al., "Initial teacher training for twenty-first century skills in the Fourth Industrial Revolution (IR 4.0)"; Menon, and Castrillón, "Reimagining curricula for the Fourth Industrial Revolution."6-19; Virtanen and Tynjälä, Factors explaining the learning of generic skills: a study of University students' experiences; Angelito Calma and Martin Davies, "Critical Thinking in Business Education: Current Outlook and Future Prospects," *Studies in Higher Education* 46, no. 11 (November 2, 2021): 2279–95, <https://doi.org/10.1080/03075079.2020.1716324>; Trevor Stanley and Stephen Marsden, "Problem-Based Learning: Does Accounting Education Need It?," *Journal of Accounting Education* 30, no. 3–4 (September 2012): 267–89, <https://doi.org/10.1016/j.jaccedu.2012.08.005>; Avril Loveless, Jeremy Burton, and Keith Turvey, "Developing Conceptual Frameworks for Creativity, ICT and Teacher Education," *Thinking Skills and Creativity* 1, no. 1 (April 2006): 3–13, <https://doi.org/10.1016/j.tsc.2005.07.001>.

<sup>35</sup> Du Preez and Le Grange, "The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access."

<sup>36</sup> Du Preez and Le Grange, "The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access."

<sup>37</sup> Motala & Menon, "Pedagogical continuities in teaching and learning during COVID-19"; Du Preez, and Le Grange, "The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access."; Jansen, "What does it mean to Teach in the Shadow of COVID-19?"; Aradhana Ramnund-Mansingh and Nikita Reddy, "South African Specific Complexities in Aligning Graduate Attributes to Employability," *Journal of Teaching and Learning for Graduate Employability* 12, no. 2 (July 30, 2021): 206–21, <https://doi.org/10.21153/jtlge2021vol12no2art1025>.

<sup>38</sup> Msila, "Digitalization and Decolonizing Education: A Qualitative Study of University of South Africa (UNISA) Leadership"; Dison, et. al "Reframing purpose and conceptions of success for a post-Covid-19 South African higher education." 33-54; Nyna Amin, Rubby Dhunpath, and Chatradari Devroop, "Uncertainties and Ambiguities of (Re)Learning 1 to Teach in the Context of Crises," in *(Re)Learning to Teach in Contexts of Crises* (London: CSSALL Publishers, 2021), 1–25, <https://doi.org/10.29086/978-0-9869936-6-4/2021/AASBS08>; Melissa Bond et al., "Digital Transformation in German Higher Education: Student and Teacher Perceptions and Usage of Digital Media," *International Journal of Educational Technology in Higher Education* 15, no. 1 (December 28, 2018): 48, <https://doi.org/10.1186/s41239-018-0130-1>.

<sup>39</sup> Le Grange et al., "Decolonising the university curriculum or decolonial-washing?"

<sup>40</sup> Samsul Hadi, Dedek Andrian, and Badrun Kartowagiran, "Evaluation Model for Evaluating Vocational Skills Programs on Local Content Curriculum in Indonesia: Impact of Educational System in Indonesia," *Eurasian Journal of Educational Research* 19, no. 82 (August 9, 2019): 1–18, <https://doi.org/10.14689/ejer.2019.82.3>; Azman Hasan, Sharifah Nurulhuda Tuan Mohd Yasin, and Mohd Fauzi Mohd Yunus, "A Conceptual Framework for Mechatronics

and it has also been adapted and used in other sectors, including business, health, and the military.<sup>41</sup> It is considered a "comprehensive framework for guiding evaluations of programs, projects, personnel, products, institutions, and evaluation systems."<sup>42</sup> The framework serves managers and administrators in conducting four distinct types of evaluation depicted by the acronym – CIPP.<sup>43</sup> Context evaluation examines the needs and opportunities of a particular community to establish the goals of a programme and the criteria for judging its outcome.<sup>44</sup> In essence, the context evaluation can be used "to set defensible goals and priorities or confirm that present goals and priorities are sound."<sup>45</sup> Input evaluation considers the approaches and work plan for implementing the programme.<sup>46</sup> Process evaluation focuses on ongoing checks to ascertain the extent to which the curriculum is implemented as intended and its efficacy.<sup>47</sup> This enables the academic to modify the process where necessary to achieve desired learning objectives. Product evaluation aims to assess the programme's achievements to ascertain its effectiveness and if the needs of stakeholders have been met.<sup>48</sup>

For the purposes of this study, context refers to the reality in which the education programme takes place, that ultimately drives the institution's (The SoE) overall goal. Input aims to assess the "(i) appropriateness of selected objectives, (ii) congruency between objectives and content, and (iii) appropriateness of the instructional strategies and assessment procedures (B.Ed curriculum). Process relates to enacting the curriculum (the module templates), while product pertains to assessing the extent to which the objectives in terms of context, input, and process are achieved (moderators' reports). This study adopted the CIPP approach Hasan, Yasin, and Yunus used in their review of the Mechatronics curriculum for a Product review of the B.Ed curriculum focusing on the context and input dimensions.<sup>49</sup> The process dimension relates to actual classroom teaching and learning, that will be assessed via class observation scheduled to take place in the latter part of the more extensive study that this article draws from.

## METHODOLOGY

This study adopted a qualitative research methodology located within an interpretive paradigm using the SoE at UKZN as a case study. Using the CIPP model, curriculum review can be done through document analysis.<sup>50</sup> In this study, document analysis of twelve remote online module templates and related moderation reports across four clusters of the SoE were reviewed using the CIPP model. According to Cohen et al., documents related to the phenomenon provide direct evidence required for the investigation.<sup>51</sup> The module templates were examined to determine the extent to which the

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Curriculum Using Stufflebeam CIPP Evaluation Model," *Procedia - Social and Behavioral Sciences* 195 (July 2015): 844–49, <https://doi.org/10.1016/j.sbspro.2015.06.324>; Daniel L. Stufflebeam, "The CIPP Model for Evaluation," in *Evaluation Models* (Dordrecht: Kluwer Academic Publishers, 2000), 279–317, [https://doi.org/10.1007/0-306-47559-6\\_16](https://doi.org/10.1007/0-306-47559-6_16).

<sup>41</sup> Stufflebeam, "The CIPP Model for Evaluation," 31.

<sup>42</sup> Stufflebeam. "The CIPP Model for Evaluation," 31.

<sup>43</sup> Tia L. Finney, "Confirmative Evaluation: New CIPP Evaluation Model," *Journal of Modern Applied Statistical Methods* 18, no. 2 (December 7, 2020): 2–24, <https://doi.org/10.22237/jmasm/1598889893>.

<sup>44</sup> Hasan, Yasin, and Yunus, "A Conceptual Framework for Mechatronics Curriculum Using Stufflebeam CIPP Evaluation Model"; Stufflebeam, "The CIPP Model for Evaluation."

<sup>45</sup> Stufflebeam, "The CIPP Model for Evaluation" 39,

<sup>46</sup> Hasan, Yasin, and Yunus, "A Conceptual Framework for Mechatronics Curriculum Using Stufflebeam CIPP Evaluation Model."

<sup>47</sup> Stufflebeam, "The CIPP Model for Evaluation."

<sup>48</sup> Hasan, Yasin, and Yunus, "A Conceptual Framework for Mechatronics Curriculum Using Stufflebeam CIPP Evaluation Model"; Stufflebeam, "The CIPP Model for Evaluation."

<sup>49</sup> Hasan, Yasin, and Yunus, "A Conceptual Framework for Mechatronics Curriculum Using Stufflebeam CIPP Evaluation Model."

<sup>50</sup> Hasan, Yasin and Yunus, "A conceptual framework for mechatronics curriculum using Stufflebeam CIPP Evaluation Model" ; Stufflebeam, The CIPP model for evaluation. In *Evaluation models*, 279-317.

<sup>51</sup> Louis Cohen, Lawrence Manion, and Keith Morrison, *Research Methods in Education* (Eighth edition. | New York: Routledge, 2018.: Routledge, 2017), <https://doi.org/10.4324/9781315456539>.

embedded learning experiences equipped students with the requisite TPACK together with other cross-functional skills in preparation for their 4IR classroom. Again, the moderation reports were analysed to understand how students' digital learning experiences possibly impacted their performance. The aim was to conduct a systematic assessment of these documents with a view to elicit meaning, obtain insight, and produce empirical knowledge<sup>52</sup> about the students' experiences and digital epistemological access to the B.Ed curriculum brought about by the digital curriculum transformation that was catalysed by the pandemic.

Particularly, this study focused on the new B.Ed curriculum that was introduced to the 2019 first-year student cohort who are currently in the fourth level of study in 2022. The B.Ed programme is offered in five clusters of the SoE – Mathematics and Computer Science Education (MCSE); Social Science Education (SSE); Science and Technology Education (STE); Language and Art Education (LAE); and Education Studies (ES). The undergraduate programmes aim to equip students with diverse disciplinary knowledge and skills to teach in primary and secondary schools across South Africa. These clusters offer both content and teaching method modules across different levels of study (years 1 to 4). Sampling was based on a random selection of two content and two teaching method modules in each level of study, cutting across the five clusters. However, the response to the request for documents was only received from four clusters; hence the ES is not represented in the final sample. Table 1 shows a list of the teaching method and content modules we analysed.

**Table 1: Module Templates Reviewed**

	Teaching Method		Content	
<b>Level One</b>			Mathematics Education for FET (MCSE)	Economics and Management Science (SSE)
<b>Level Two</b>	English Education Method 1 (LAE)	Life Science Education Method 1 (STE)	Science and Technology Education 1 (STE)	Accounting Education 3 (SSE)
<b>Level Three</b>	Mathematics Method 2 (MCSE)	Accounting Method 2 (SSE)	Physical Science Education 3 (STE)	Accounting Education 5 (SSE)
<b>Level Four</b>	Physical Science Method 3 (STE)	Accounting Method 3 (SSE)		

## Data Presentation and Discussion

### Overview

Each module template begins with the introductory section (providing details about the course). The module aims, learning outcomes, content topics, and plans for remote sessions are broken down into weekly sessions. Each session specifies the learning outcome and the planned mode of delivery. The last part of the template covers plans for remote assessments, moderation, and communication with students. Sections of two remote online templates for the English and Life Science Education Modules (level two teaching method modules) reviewed are presented in table 2 below.

<sup>52</sup> Juliet Corbin and Anselm Strauss, *Basics of Qualitative Research (3rd Ed.): Techniques and Procedures for Developing Grounded Theory* (2455 Teller Road, Thousand Oaks California 91320 United States : SAGE Publications, Inc., 2008), <https://doi.org/10.4135/9781452230153>.



**Table 2: Module Template Analysis- Teaching Method Modules (level 2)**

Cluster	Language & Arts Education	Science & Technology Education
Levels	<b>Two</b>	<b>Two</b>
Module Name	<b>English Education: Method 1 Introductory concepts</b>	<b>Life Science Education Method 1</b>
Module Aim	To prepare student teachers to meet the challenges of teaching and developing their own knowledge and understanding of English.	-The aim of this module is to familiarise students with learning theories relevant to the discipline, as well as the school life sciences curriculum, with special reference to the specific aims of the Curriculum Assessment Policy Statements (CAPS) curriculum. Furthermore, the module will focus on the development of skills, including the use of Information and Communications Technology (ICT), related to teaching the content topics covered in Biological Science Education content modules of the CAPS curriculum.
Learning Outcome	To: -Introduce concepts and constructs associated with becoming a teacher of English in South African landscape, Interrogate documents, engage with lesson planning and preparation, and integrate teaching and learning resources. -focus on first and second language acquisition.	-Demonstrate an understanding of the specific aims of the biology curriculum and how these aims shape the curriculum -Identify different learning theories in different teaching and learning strategies -Use diagrams appropriately in lesson planning Demonstrate understanding of the use of models in Biology Education -Use laboratory equipment appropriately in Biology Education -Reflect on own professional practice
Content topic (extract)	-Teaching of English: Understanding and responding to the South African landscape -Interrogating the National Education Teacher Framework – for the teacher of English; Interrogating curriculum documents) FET English) (3wks) -Lesson Planning and Preparation (FET)	-Exploring the curriculum document CAPS -Understanding Lesson Planning -Exploring lesson presentation -Exploring Assessment in Life Science -The role of diagrams in teaching Biology -The use of models in teaching Biology -Laboratory work and equipment in science teaching and learning
Mode of delivery	PowerPoint with audio, notes, and reading text/articles	-Zoom Lecture, -YouTube links -WhatsApp discussions
Assessments	2 Assignment (50%) 2 MCQ (50%)	-8 Assignments & Tasks - 50% -Main Task - 50%
Communication	Moodle, WhatsApp, emails, and Zoom for clarification	Moodle, WhatsApp, and Skype

## Teaching method modules

Teaching method modules usually commence in the *second year* of study. The Life Sciences and English Method 1 programmes aim to equip students with basic pedagogical skills as introductory method modules. Since both courses were offered online, students' engagement with the curricula offerings should facilitate acquiring or developing some level of digital technological skills. However, the Life Science programme explicitly incorporates developing students' ICT skills as one of the key aims. This is deemed essential in fostering digital competence where students control and use ICT in search of knowledge, communication, creation and learning.<sup>53</sup> This reflects a competency-based digitised curriculum.<sup>54</sup> Even though the intended teaching approaches were not indicated, this can be inferred from the mode of delivery. Using PowerPoint slides with audio in a virtual platform, as stated in the English module template, typically entails utilising the voice-over feature to explain and present the content. This is synonymous with lecturing in the physical classroom, where the academic disseminates the content with the aid of PowerPoint slides suggesting an instrumental approach that usually involves limited student interaction.<sup>55</sup> Such an approach promotes passive forms of learning, which deviates from the tenets of the competency-based curriculum and is less ideal in the workplace.<sup>56</sup> The use of WhatsApp discussion in the Life Sciences module provides a forum where students air their views, usually in a communal space, thus enhancing communication and negotiation skills as well as other higher-order thinking skills.<sup>57</sup> If enacted as planned, the learning experiences afforded by the Life sciences digitalised curriculum should further the development of digital competence, interpersonal, analytical, and innovative skills required of the workforce of the 4IR as stipulated for Education 4.0.<sup>58</sup>

The *third-level* Math teaching method module aimed to enable students to facilitate learning. Besides equipping students with the ability to demonstrate knowledge, and analyse and interpret errors, the curriculum also intends to enable them to design teaching materials and develop learning programmes. Analytical thinking is a precursor for problem-solving, while designing more often stimulates innovative thinking required of the workforce of the 4IR as stipulated in Education 4.0.<sup>59</sup> Like the Life Sciences method 1 module, the last outcome in the Math template provided for the use of technology in exploring ideas and concepts in mathematics, thus tending toward a digitised curriculum.<sup>60</sup>

The *third-level* Accounting Method 2 module planned to introduce students to curriculum issues and theories related to teaching the subject. Students are also expected to apply learned concepts and critically engage with concepts and teaching methods. Critical thought is required in proffering

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<sup>53</sup> World Economic Forum. The future of jobs reports 2020; Annika Bergviken Rensfeldt and Catarina Player-Koro, "Back to the Future": Socio-Technical Imaginaries in 50 Years of School Digitalization Curriculum Reforms," *Seminar.Net* 16, no. 2 (December 17, 2020): 20, <https://doi.org/10.7577/seminar.4048>; Anne Kjellsdotter, "Didactical Considerations in the Digitalized Classroom," *Doctoral Thesis* (2020), <https://gupea.ub.gu.se/handle/2077/63174>.

<sup>54</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; Gagnon et. al. "Key aspects to the design, development, deployment and evaluation of a fully digitised undergraduate programme."

<sup>55</sup> Virtanen and Tynjälä, Factors explaining the learning of generic skills: a study of University students' experiences.

<sup>56</sup> World Economic Forum. The future of jobs reports 2020.

<sup>57</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; World Economic Forum. The future of jobs reports 2020; Virtanen, & Tynjälä, Factors explaining the learning of generic skills: a study of University students' experiences.

<sup>58</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the Fourth Industrial Revolution*.

<sup>59</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the Fourth Industrial Revolution*; World Economic Forum. The future of jobs reports 2020; Teo et.al. "Initial teacher training for twenty-first century skills in the Fourth Industrial Revolution (IR 4.0)"

<sup>60</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; Gagnon et al. "Key aspects to the design, development, deployment and evaluation of a fully digitised undergraduate programme."

reasonable solutions and is deemed essential in the workplace.<sup>61</sup> Both templates offer a summary of the content. Still, a detailed sequential breakdown of the Accounting content assists the academic in planning delivery and helps students know what is expected of them weekly. While the Math module was silent on the mode of delivery, the learning experiences documented in the Accounting template should be facilitated via *recorded lectures uploaded on Moodle* and *zoom class meetings* for assessing *online video presentations*. The math module made room for two *major tests* and other assessments, including a *presentation*. Making videos usually requires engagement with digital technologies, while the presentations stimulate discussions and enhance communication skills, which is essential in the global community.<sup>62</sup>

In the new B.Ed programme, the *fourth-year* curriculum, is being implemented for the first time in 2022 because of the gradual phased-in roll-out strategy, that commenced in 2019. At this level, the module templates reviewed from Social Science and Science clusters aimed to enable students with skills to *critique the curriculum and teaching methods, understand assessment theories, and develop problem-solving skills while designing tests and teaching resources*. In the Social Science class, teaching will be done via *recorded lectures* and *PowerPoint slides* uploaded into the learning management system - *Moodle*. The bulk of the class time will be spent on *teaching presentations and discussions* via *zoom* and *WhatsApp* by students using different learner-centred approaches such as *game shows, role play, Jigsaw, and blended teaching methods*, to name a few. The presentations and two assignments make up the summative assessment for the semester. In this module, formative assessments are planned to be conducted via *tutorials* that were uploaded on *Moodle*. However, the details of the tutorials and assignments are not indicated on the templates. Students will be exposed to the relevant content via *zoom lectures and Moodle* in the Physical Science module. The detailed weekly sessions involve *discussions, problem-solving, and research*, which require active student participation. Half of the continuous assessment comprises five mini-tasks and the other half is one main summative task.

As students critique information, design teaching resources, and engage in research and problem-solving activities, they develop critical, innovative, and analytical skills needed to thrive in their future workplace.<sup>63</sup> Students build communication skills during class discussions and presentations as they interact in a communal virtual learning space suggestive of a competency-based curriculum model.<sup>64</sup> Thus, the aims and planned approaches to teaching and assessments of the two fourth-year module templates have the propensity to develop cross-functional skills associated with higher-order thinking.

### Content modules

In the *first year* of study, each cluster usually offers only content modules to students. The authors of this article reviewed the module templates for Mathematics and EMS at this level. Regarding the context dimension, while the Math module aimed to *develop students' knowledge and skills* to enable *rigorous engagement with geometry and trigonometry*, the EMS module aimed to *develop introductory content knowledge and skills* relating to *basic accounting for Sole Trader*. In addition, the former

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<sup>61</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the Fourth Industrial Revolution*; World Economic Forum. The future of jobs reports 2020; Virtanen and Tynjälä, Factors explaining the learning of generic skills: A study of University students' experiences.

<sup>62</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the Fourth Industrial Revolution*; World Economic Forum. The future of jobs reports 2020; Teo et al., "Initial teacher training for twenty-first century skills in the Fourth Industrial Revolution (IR 4.0)."

<sup>63</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the fourth industrial revolution*; World Economic Forum. The future of jobs reports 2020; Teo, et.al, "Initial teacher training for twenty-first century skills in the Fourth Industrial Revolution (IR 4.0)"; Virtanen, and Tynjälä, Factors explaining the learning of generic skills: A study of University students' experiences.

<sup>64</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21. Gagnon et. al., "Key aspects to the design, development, deployment and evaluation of a fully digitised undergraduate programme."

planned to contribute to developing the student as a *researcher and life-long learner*. In the input dimension, students are expected to *understand* and *apply* concepts and skills in both modules. Moreover, the Math module aimed to enable students to *use various technological tools to explore mathematical concepts*. The intended mode of delivery for the Math module was through Moodle, Zoom, WhatsApp, Sketchpad, and PowerPoint, while the EMS course was predominantly via recorded Zoom lectures and online tutorials. There was no clear indication of the planned teaching strategies or other teaching resources. Assessments in the EMS module comprised two equally weighted summative tests, while Math consisted of six short tests and one major test for 60% of the semester mark.

Both first-year modules aim to provide students with experiences that will enable the transfer of learning. However, the Math module does more with plans to integrate technology into content acquisition while contributing to developing lifelong learning skills, thus facilitating the skills set of the 4IR workplace.<sup>65</sup> The learning mode is also more diverse in the Math module, characteristic of the competency-based curriculum.<sup>66</sup> While the non-inclusion of the planned teaching approaches and resources in both templates tend to impede analysis using both criteria, which may be perceived as being problematic, it may infer a more flexible approach to classroom practices suggestive of the Competency-based curriculum.<sup>67</sup> The online tutorials in the SS module may be regarded as formative assessments aimed at enhancing learning, while the Math module appears to be silent on this.

In the *second level*, the authors reviewed the STE 1 module and Accounting Education 3. Based on heuristics for classifying learning behaviour and intellectual abilities, the Accounting module should facilitate learning transfer as students *apply* (middle-order thinking level) knowledge and skills in preparing financial statements.<sup>68</sup> Learning delivery via *recorded lectures* and *textbook practice materials* elicit minimal interaction, suggesting passive forms of learning indicative of a performance-based curriculum.<sup>69</sup> The STE provides for teaching and learning via *lectures* and *practical* sessions to be complemented with *interactive quizzes* and *group chats* in communal virtual spaces while facilitating independent learning, communication, and collaboration. There were also plans to use *YouTube videos of the lecturer demonstrating practicals and simulations*. Of the two programmes, the experience from the STE curriculum is closer to the digitalised competency-based curriculum and is more likely to build interpersonal skills needed to collaborate with others in the global work community that awaits them.<sup>70</sup> Although the non-inclusion of the module aims and outcome in the STE template is flawed, it appears to be a document design error because there is no provision for those items in the template.

The third level analysis focused on the STE and SSE clusters. The former aimed to *develop* students so they could *engage meaningfully in the study of Physics*. The latter sought to *enable preservice teachers to develop content knowledge and skills in financial reporting*. Both modules should facilitate learning transfer as students *understand* and *apply* key concepts and skills in their respective course content. The principal medium of delivery for the SSE module was via *PowerPoint with audio* and *Zoom lectures uploaded on Learn 21 (Moodle)*. *Tutorials uploaded on Moodle* and

<sup>65</sup> World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the fourth industrial revolution*; World Economic Forum. The future of jobs reports 2020; Teo et al., "Initial teacher training for twenty-first century skills in the Fourth Industrial Revolution (IR 4.0)."

<sup>66</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; Chisholm, "Curriculum transformation: From didactic to competency-based programs in Pharmaceutical Medicine."

<sup>67</sup> Khoza and Mpungose, "Digitalised Curriculum to the Rescue of a Higher Education Institution."

<sup>68</sup> Anderson et. al., *A Taxonomy for Learning, Teaching, and Assessing*.

<sup>69</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; World Economic Forum. The future of jobs reports 2020.

<sup>70</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the Fourth Industrial Revolution*; World Economic Forum. The future of jobs reports 2020; Chisholm, "Curriculum transformation: from didactic to competency-based programs in Pharmaceutical Medicine."; Teo, et.al, "Initial teacher training for twenty-first century skills in the Fourth Industrial Revolution (IR 4.0)."; Virtanen and Tynjälä, Factors explaining the learning of generic skills: a study of University students' experiences.

*practice materials* from the *textbook* were planned for students to consolidate learning. Such instrumental approaches hardly elicit students' active participation, thereby promoting passive forms of learning depicting a performance-based curriculum.<sup>71</sup> In addition to the medium and teaching aids planned in the SSE module, the STE planned *live Zoom lectures* and *tutorial* sessions that could provide a platform for discussion and interaction amongst the learning community. The use of synchronous and asynchronous modes of delivery is usually advised in an online environment to enhance knowledge construction in a communal context associated with the competency-based curriculum.<sup>72</sup> This also goes a long way to limiting the isolation associated with online learning.<sup>73</sup> In terms of assessments, both templates provide formative and summative tests. Even though the nature of the assessments was not stated, formative assessments usually enable students to engage with the learning materials and enhance learning from feedback provided, while the summative tool should assess the extent to which the learning objectives have been attained. Subsequent classroom observation and document analysis planned for the larger study in the Process evaluation will provide insights into the nature and experiences of assessments in the enacted curriculum at the research site.

Both modules do not explicitly intend to equip students with digital technological skills, but the use of online platforms for learning tacitly implies the development of digital technological skills.<sup>74</sup> However, the extent to which such exposure offers the digital literacy needed to navigate the workspace as global citizens remains debatable.<sup>75</sup>

### Assessment Moderation Reports

Each cluster prepares a composite moderation report drawn from the individual module moderation report at the end of each semester. The report indicates the pass rate for each module, a summary of the strengths and weakness identified by the internal examiner and moderators (internal and external), and the way forward indicating how identified weaknesses can be addressed. In some reports, the comments are module-specific; in others, the comments are rather general but highlight modules with other concerns unrelated to the general comments. In this study, the authors reviewed the 2020 and 2021 assessment moderation reports that corresponded with the module templates analysed.

After an extended 2020 academic session, the 2021 programme was completed in a slightly shorter timeframe as many traditional place-based HEIs adapted to the online mode of education. Recognising success based on students' pass rates portrays improvements across many modules in many educational institutions including the SoE.<sup>76</sup> Although these results are desirable, the digital learning journey has been challenging for some students. An analysis of the module moderation reports for the selected teaching method and content modules courses reveals that despite the overall high pass rates attained when compared to the pre-COVID-19 era, there were many challenges and difficulties associated with the digital learning platform. The moderation reports indicated that there was a high rate of cheating and collusion, as evidenced by academics who submitted photo evidence of a *large*

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<sup>71</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21.; Du Preez & Le Grange, "The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access." World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the Fourth Industrial Revolution*.

<sup>72</sup> Khoza and Mpungose, "Digitalised curriculum to the rescue of a higher education institution." *African Identities*, 1-21; Arek-Bawa and Reddy, "Blending Digital and Technological Skills with Traditional

<sup>73</sup> Amin et al., "Uncertainties and Ambiguities of (Re)learning to Teach in the Context of Crises." ; Ikyoive and Sheik, "De-humanising the Humanities Curriculum," 115.

<sup>74</sup> Arek-Bawa and Reddy, "Blending Digital and Technological Skills with Traditional Commerce Education," 144.

<sup>75</sup> Du Preez and Le Grange, "The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access." Dison et al., "Reframing purpose and conceptions of success for a post-COVID-19 South African higher education." 34.

<sup>76</sup> Dison et al. "Reframing purpose and conceptions of success for a post-COVID-19 South African higher education." 34; Tafirenyika Mafugu, "A Comparison of Selected Assessment Results before and during the COVID-19 Pandemic in One University in South Africa.," *International Journal of Higher Education* 10, no. 7 (2021): 74–83, <https://doi.org/10.5430/ijhe.v10n7p74>.

*group of mathematics students working on a quiz together* that was supposed to be done individually. A high rate of cheating was also observed in the SSE. To overcome this challenge, academics requested a summative assessment on campus under examination conditions. In the first-year Math module, students were given three extra assessment tasks to improve their performances as some *struggled to upload their responses*. Similarly, in the third-year method module, students were given extra opportunities to improve their grades. The SSE students were also *afforded make-up opportunities*.

The third-year modules recorded low student attendance and interaction in the STE report as *'students simply do not communicate or ask for help'*, with three students not writing *the final summative test*. Attendance in the second-year STE method module also dwindled towards the end of the semester due to *problems with access – to the internet*. While one academic called for *the absence from lectures rule* that makes attendance mandatory to be introduced, another academic advocated for contact teaching *to interact directly with students as most avoid communicating electronically*. The situation in the SSE was no different. Besides *digital and network coverage difficulties*, there were reports of *poor student participation, even with students receiving data and vulnerable students having access to wifi on campus*. Academics *struggled to contact students using all platforms possible* with little success. *In some cases, students did not access Learn 2021*.

Based on the submissions of the moderators' reports, academics attributed the poor attendance/engagement to digital learning. These findings are similar to Motala and Menon's study where academics found it challenging to secure regular student engagement in spite of sophisticated student tracking systems.<sup>77</sup> Indeed, digital inequality is also a function of the level of engagement.<sup>78</sup> Inability to interact or communicate electronically could result from the (fear of the unknown) anxiety associated with digital learning, low levels of digital literacy, or other barriers, including unconducive home conditions and electricity disruptions.<sup>79</sup> All these issues negatively affect students' attainment of the module outcomes. It can be inferred that the digitised curriculum limited epistemological access for those students who were unable to access/operate/understand the transformed digital curriculum, thereby deepening the digital knowledge/learning divide instead of contributing to developing skills fit for the 4IR classroom.<sup>80</sup>

Moreover, the relatively higher pass rates may not have resulted from acquiring relevant TPACK afforded by the digitised curriculum experience. Instead, it would appear that some students have found ways to capitalise on the loopholes in the systems to achieve high performance without necessarily demonstrating learning.<sup>81</sup> Irrespective of the impressive student performance, the extent to which their digital curricular experience prepares them for their future workplace remains questionable. Some universities may see this drawback as a valid reason to return to the pre-pandemic contact mode of teaching, learning, and assessment, that may be justifiable for the purposes of academic integrity. After all, one of the main objectives of schooling is to acquire high-quality knowledge and

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<sup>77</sup> Motala and Menon, "Pedagogical continuities in teaching and learning during COVID-19."

<sup>78</sup> Carmen Steele, "What Is the Digital Divide? | Digital Divide Council," accessed November 3, 2022, <http://www.digitaldividecouncil.com/what-is-the-digital-divide/>.

<sup>79</sup> Du Preez and Le Grange, "The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access." Motala, & Menon, "Pedagogical continuities in teaching and learning during COVID-19": Jansen, "What does it mean to Teach in the Shadow of COVID-19?"

<sup>80</sup> Du Preez and Le Grange, "The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access."

<sup>81</sup> Mafugu, "A Comparison of Selected Assessment Results before and during the COVID-19 Pandemic in One University in South Africa."; L Bakhmat, O Babakina, and Ya Belmaz, "Assessing Online Education during the COVID-19 Pandemic: A Survey of Lecturers in Ukraine," *Journal of Physics: Conference Series* 1840, no. 1 (2021): 012050, <https://doi.org/10.1088/1742-6596/1840/1/012050>; Ahmad Fuad Abdul Rahim, "Guidelines for Online Assessment in Emergency Remote Teaching during the COVID-19 Pandemic," *Education in Medicine Journal* 12, no. 2 (June 30, 2020): 59–68, <https://doi.org/10.21315/eimj2020.12.2.6>.

skills to contribute productively to society.<sup>82</sup> If the learning mode hinders the attainment of this objective, then there is a need to revert to the status quo or go back to the drawing board.

However, the world is moving on. Digital technologies have come to stay, advancing exponentially and the shift towards online pedagogies has become the new norm.<sup>83</sup> For HEIs to stand aloof or shield themselves from the digital technology transformation irrespective of contextual challenges will be somewhat naïve.<sup>84</sup> To take this stance will be doing the institution and its stakeholders a disservice with dire consequences. Such an institution will become uncompetitive and lose its relevance over time as it fails to deliver its primary mandate – undergraduate teaching.<sup>85</sup> Students will graduate into the pool of the unemployed because they are ill-equipped to partake in a global community of digital citizens while the community stagnates as the world moves.<sup>86</sup> Rather, as agents of change, the authors of this article believe that HEIs like UKZN should carry their students and the community along as they continue to champion a contextualised digital curricular transformation during and beyond the time of crisis.

## CONCLUSION AND RECOMMENDATIONS

The analysis of the remote module templates from the different clusters in the SoE revealed that the transformed digital B.Ed curriculum would likely provide students with varied learning experiences of content and digital skills. While some learning experiences tend to be more performance-based, others possess some qualities affiliated with the competency-based curriculum with more capacity to prepare teachers for the 4IR classrooms. Some templates had explicit module aims and outcomes targeted at equipping students with ICT skills needed to foster digital competence, while others were silent. Some templates described approaches with the potential to enable critical thought, analytical thinking, collaborative skills, and other cross-functional skills affiliated with the competency-based curriculum, while other templates contained rather passive forms of learning synonymous with a performance-based curriculum. As such, some students will be better prepared to face the realities of the 4IR classroom than others due to their digital curriculum experiences. The findings further pointed to a possible epistemological limitation for some students who battle to engage the digitalised curriculum arising from a contextual digital divide. Analysing the moderators' reports provided narratives highlighting the challenges and difficulties students experience whilst undertaking assessments. While the pass rates improved from pre-COVID-19 times, the reports also indicated that the academic integrity of the assessment process requires closer investigation.

In pursuit of a curriculum that is geared towards contributing to the talent pool of the 4IR classroom while meeting the needs of the local environment,<sup>87</sup> the authors of this article advocate for a contextualised digital curriculum transformation now and in the new normal. Such a curriculum is cognisant of the prior digital experience of the rural students<sup>88</sup> and therefore seeks to bridge the digital learning divide. To achieve this in the SoE, enhancing students' digital technology competence is vital.

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<sup>82</sup> Karen Koopman and Oscar Koopman, "The Dark Side of Online Teaching and Learning in South African Universities," 2022, 145–68.

<sup>83</sup> Jansen, "What does it mean to Teach in the Shadow of COVID-19?" World Economic Forum [WEF]. *Schools of the future: Defining new models of education for the fourth industrial revolution*; World Economic Forum. The future of jobs reports 2020

<sup>84</sup> Z Waghid and F Waghid, "Examining Digital Technology for (Higher) Education through Action Research and Critical Discourse Analysis," *South African Journal of Higher Education* 30, no. 1 (May 2016), <https://doi.org/10.20853/30-1-562>.

<sup>85</sup> Jansen, "What does it mean to Teach in the Shadow of COVID-19?" PWC. *Workforce of the future 2030 Global trends challenged by African Realities*.

<sup>86</sup> Menon & Castrillón, "Reimagining curricula for the Fourth Industrial Revolution." 6-19; World Economic Forum. The future of jobs reports 2020; Ramnund-Mansingh & Reddy, "South African specific complexities in aligning graduate attributes to employability."

<sup>87</sup> Stufflebeam, "The CIPP Model for Evaluation."

<sup>88</sup> Msila, *Digitalization and Decolonizing Education: A Qualitative Study of University of South Africa (UNISA) Leadership*.

The first-year orientation programmes could include sessions to introduce students to digital technologies. Thereafter, a digital literacy programme similar to the existing academic literacy drive could be implemented for all students, especially in their first year of study. In addition, regular ICT training programmes could be facilitated to enhance students' digital competence so that they become comfortable with digital technologies.

As key drivers of digital education, academics should be exposed to professional development programmes to acquaint themselves with varied online pedagogical practices to facilitate meaningful and interactive learning. Also, a further curriculum review of the digitalised B.Ed curriculum is required to determine the extent to which every module includes the development of students' digital technological skills as one of the curricula aims. This will enable students and graduates to use digital technologies in accessing knowledge, creating content, and teaching in the 4IR classrooms. As part of an ongoing curriculum transformation process, there is a need to review curriculum exemplars to incorporate active learning approaches that develop cross-functional skills desired in the workplace. Finally, the institution needs to strengthen its quality assurance capacity to incorporate various tools to ensure credibility of online assessment practices. It is hoped that the above recommendations will in no small way contribute to developing a curriculum that accommodates the contextual realities of the diverse student body to ensure a successful and sustainable digital curricula transformation beyond the pandemic era.

Like any other research, this study is not without its limitations. In the first place, the conclusions reached are based on the review of curricular documents, that is the intended curriculum. The enacted curriculum may be approached differently, resulting in a different conclusion. This calls for a curriculum process review to provide a holistic understanding of the digitalised curricular transformation in the SoE. The larger study that this article draws from aims to fill this void by producing data generated through in-class observations and interviews with academics and students. Interested researchers can examine the digitised curriculum from the students' perspective to understand their digital learning experience and digital access. Also, this article is based on a review of twelve curriculum exemplars and their corresponding assessment moderators' reports. A larger sample may likely provide a slightly different outcome.

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## ABOUT AUTHORS

Dr. Orhe Arek-Bawa is a Postdoctoral Fellow – Higher Education Studies at the School of Education Higher Education Studies, University of KwaZulu-Natal, South Africa. Her research focuses on Digital transformation and the Fourth Industrial Revolution, Assessment and Cognitive demand, Development, use, and adoption of electronic textbooks in Accounting Education and Virtual learning in Higher Education.

Prof. Sarasvathie Reddy is an Associate Professor of Higher Education Studies and the Academic Leader of the Education and Development Studies Cluster - School of Education Higher Education Studies, University of KwaZulu-Natal, South Africa. Her research focuses on Diversity in higher education, Curriculum development and design, Doctoral education, Academic staff and student development and Assessing learning in the higher education context.