AN ANALYSIS OF STUDENT TEACHERS' E-READINESS FOR DIGITAL EDUCATION ENVIRONMENT IN COVID -19 TIMES

Paseka Patric Mollo
Department of Educational and Professional Studies, Central University of Technology (South Africa)

Abstract

The COVID-19 pandemic and the hygienic measures of social distance brought impasses to education and its future. Face-to-face activities are suspended and this accelerated use of Information Communications Technology (ICT) in most environments including education. Based on these changes, teacher education and training at universities should prepare prospective teachers that are able to function within the digital and virtual classrooms. This paper investigates the level to which student teachers were exposed to Technological Pedagogical Content Knowledge (TPACK) needed by them to function within the digital & virtual classrooms during and post COVID-19 times. The paper analyses, Central University of Technology (CUT) final year Bachelor of Education student teachers' e-readiness to integrate ICT and present lessons in digital classrooms. A total of 60 student teachers were purposively selected to participate in this study. Data was collected using online questionnaires. A 5-point Likert scale questionnaire was used to collect data from student teachers. Subsequently, results revealed that student teachers are aware of the importance of ICT and e-learning in schools. However, they acknowledge that they have limitations, and they are not ready in implementing them in digital & virtual classrooms. The study concludes by offering several theoretical and practical recommendations for the e-readiness of student teachers in such environments.

Keywords: *e-Learning, e-readiness, information communications technology (ICT), teacher education.*

---

1. Introduction

The COVID-19 pandemic is one of the eight declared pandemics since the beginning of the 21st century. It is among the six pandemics that directly damage the respiratory system in human beings (Guillén, Cuellar & Alfaro, 2020). In preventing the spread of this pandemic, health authorities have recommended among other contagion prevention measures, social distancing, wearing of masks, and social confinement. As a result of these measures, COVID-19 has streamlined the obligatory use of Information Communications technology (ICT) in most fields and services including education (Guillén, Cuellar & Alfaro, 2020, Lake & Dusseault, 2020).

Face-to-face teaching was interrupted in schools around the world during 2019 to 2020 academic years due to this pandemic (Lake & Dusseault, 2020). Remote teaching and learning were then encouraged by most education authorities around the world. Faced with this need for change, schools are challenged by this new normal because most teachers are not properly trained for these forms of teaching (Guillén, Cuellar & Alfaro, 2020). This is because remote teaching and learning required teachers to be skilled in, among others, online teaching, blended teaching, e-learning, m-learning, the use of Learner Management Systems (LMS), Open Education Resources (OER), the use of the Internet, etc.

In addition to teachers' challenges, many working parents and parents, in general, are struggling to help in the education of their children (Department of Basic Education, 2018). This is because remote learning predominantly requires the assistance of parents at home. In essence, it requires a higher level of literacy and education from the side of parents, and this poses a challenge to illiterate parents, especially in third-world countries like South Africa.

Like many other countries, the South African government through the Department of Basic Education encourages the introduction of remote teaching and learning during this period of the pandemic. Schools were encouraged to use online teaching and learning, blended learning, e-learning, m-learning, and many ICT integrated strategies for teaching and learning. Noticing this global trend compelled teacher training institutions like universities to be serious in infusing the use of ICT in teacher training. The Central University of Technology (CUT) like most universities had to equip student teachers that are studying for the Bachelor of Education (B.Ed) degree with ICT integration skills.

The purpose of this empirical paper is to investigate the level to which student teachers at CUT are exposed to the integration of ICT in their teaching.

2. Methodology

To investigate the e-readiness of student teachers' ability to integrate ICT in their classrooms. This paper employed a qualitative research approach. The study used an online questionnaire administered through the university's LSM. A purposive sample of 60 student teachers, from a total population of about 600 student teachers that are in the 4th year of their B. Ed degree was used to identify participants in the study. a closed structured questionnaire was designed using a 5 Likert scale of agreements with the variables ranging from Strongly Agree (1); Agree (2); Neutral (3); Disagree (4) and Agree (5).

The structure of the questionnaire is framed around the Technological Pedagogical Content Knowledge (TPACK) model. This was done to identify the acquired and / lacking knowledge domains regarding ICT integration in the classroom. Seven themes were identified according to the TPACK framework, these are Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), Technological Pedagogical Content Knowledge (TPACK).

3. Results & discussions

The aim of this paper was to investigate the e-readiness of student teachers in the integration of ICT for digital education in COVID-19 times. The structure of the questionnaire was in the form of the seven (7) knowledge domains of the TPACK framework. Four statements were put for each knowledge domain.

Table 1. Student teachers' Content Knowledge (CK).

	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
1	I have adequate knowledge about my specialization teaching subject	32(53,3%)	28(46,7%)	0(0%)	0(0%)	0(0%)	60(100%)
2	I can use subject-specific strategies of thinking in my specialization teaching subject	32(19%)	28(41,6%)	0(0%)	0(0%)	0(0%)	60(100%)
3	I know the basic theories and concepts of my specialization teaching subject	17(28,3%)	31(51,7%)	12(20%)	0(0%)	0(0%)	60(100%)
4	I know the history and development of important theories in my specialization teaching subject	7(11,7%)	32(53,3%)	12(20%)	8(13,3%)	1(1,7%)	60(100%)

This domain refers to the outstanding knowledge of the subject matter that teachers must have to teach. A teacher must have a thorough understanding of the subject matter or content that they are going to teach. Content knowledge requires teachers to have an understanding and deep knowledge of the subject area they are teaching (Shulman, 1987; Mishra & Koehler, 2006; Koehler, Mishra & Cain, 2013). From the table above most of the respondents seemed to agree that they have been provided with adequate and required content knowledge to teach the subjects of their specialization.

Table 2. Student teachers' Pedagogical Knowledge (PK).

	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
1	I can alter my teaching based upon what students understand or do not understand	24(40%)	29(48,3%)	7(11,7%)	0(0%)	0(0%)	60(100%)
2	I can adapt my teaching style to different learners	24(40%)	29(48,3%)	7(11,7%)	0(0%)	0(0%)	60(100%)
3	I can use a variety of teaching approaches in a classroom setting	24(40%)	29(48,3%)	7(11,7%)	0(0%)	0(0%)	60(100%)
4	I can assess student learning in multiple ways for different learners	16(4,9%)	31(8,5%)	11(3,5%)	2(53,5%)	0(0%)	60(100%)

Pedagogical knowledge refers to a deepened understanding of strategies, methods, and processes that teachers should employ in the teaching and learning of their respective subject specializations. It involves a thorough understanding of the aims and objectives of a subject, the educational purpose and values of the subject, the ability to plan activities that will make the learning of the subject easy and make the subject relevant and enjoyable to learners (Mishra & Koehler, 2006, 2008; Koehler, Mishra & Cain, 2013). Most respondents agree that they can handle differentiated pedagogies. However, they are slightly not in agreement when it comes to the administering of assessments in their classrooms.

Table 3. Student teachers' Pedagogical Content Knowledge (PCK).

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
1	I know how to select effective teaching approaches to guide student thinking and learning	32(53,3%)	28(46,7%)	0(0%)	0(0%)	0(0%)	60(100%)
2	I know how to develop appropriate tasks to promote students complex thinking	32(19%)	28(41,6%)	0(0%)	0(0%)	0(0%)	60(100%)
3	I know how to develop exercises with which students can consolidate their knowledge	17(28,3%)	31(51,7%)	12(20%)	0(0%)	0(0%)	60(100%)
4	I know how to evaluate student's performance in my teaching subject	7(11,7%)	32(53,3%)	12(20%)	8(13,3%)	1(1,7%)	60(100%)

PCK is about the knowledge and understanding of a subject matter taught, meaning the pedagogy of a specific subject. PCK relates to Shulman's (1986: 4) belief that "real teaching requires an understanding of both content and pedagogy". It does not require one to be just a content expert or just a pedagogy expert, but it requires teachers to have the expertise to match content with relevant pedagogy so that effective learning can take place (Mishra & Koehler, 2006). The indication is that student teachers are appropriately capacitated with the PCK.

Table 4. Student teachers' Technological Knowledge (TK).

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
1	I am aware of new technologies in education	13(21,7%)	14(23,3%)	22(36,7%)	9(15%)	2(3,3%)	60(100%)
2	I frequently latest technologies used in my subject specialization	13(21,7%)	14(23,3%)	22(36,7%)	9(15%)	2(3,3%)	60(100%)
3	I know about a lot of different technologies applied in education	9(15%)	13(21,7%)	21(35%)	12(20%)	5(8,3%)	60(100%)
4	I have the technical skills I need to use educational technology	9(15%)	13(21,7%)	22(36,7%)	12(20%)	4(6,6%)	60(100%)

The technological component of this framework was added to the original PCK framework of Shulman (1986) by Mishra & Koehler in 2006. They referred to this knowledge as the teachers' standard knowledge of technology, and the skills to operate technologies (Mishra & Koehler, 2006, 2008). TK requires a deep understanding and mastery of ICT so that they can access, process, and disseminate information (Graham, 2011). The technological knowledge is still a challenge to the respondents. Most of them are neutral with their knowledge of educational technologies while some indicated that they lack this kind of knowledge.

Table 5. Student teachers' Technological Pedagogical Knowledge (TPK).

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
1	I can choose appropriate technologies to enhance the teaching approaches for lessons	7(11,7%)	11(18,3%)	21(35%)	15(25%)	6(10%)	60(100%)
2	I can choose appropriate technologies that enhance students' learning	7(11,7%)	11(18,3%)	21(35%)	15(25%)	6(10%)	60(100%)
3	I can adapt the use of the technologies that I am learning about to different teaching activities	7(11,7%)	11(18,3%)	21(35%)	15(25%)	6(10%)	60(100%)
4	I can think critically about how to use educational technology in my classroom	7(11,7%)	11(18,3%)	21(35%)	15(25%)	6(10%)	60(100%)

TPK refers to the shared relationship between technology and pedagogy. It is defined as the teacher's knowledge and understanding of the use of technology devices that can advance the attainment of pedagogic goals (Koehler, Mishra & Cain, 2013). It is the teacher's ability to select the most suitable tools or applications based on their appropriateness for the specific pedagogical approach (Koehler, Mishra & Cain, 2013). TPK seems to be a challenge to the respondents because the majority of them are neutral about the statements and a number of them are in disagreement with the statements.

Table 6. Student teachers' Technological Content Knowledge (TCK).

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
1	I know how technological developments have changed the field of my subject	3(11,7%)	10(18,3%)	17(35%)	19(25%)	11(10%)	60(100%)
2	I can explain which technologies have been used in research in my field	3(11,7%)	10(18,3%)	17(35%)	19(25%)	11(10%)	60(100%)
3	I know which new technologies are currently being developed in the field of my subject	2(11,7%)	8(18,3%)	18(35%)	20(25%)	12(10%)	60(100%)
4	I know how to use technologies to participate in scientific discourse in my field	2(11,7%)	8(18,3%)	18(35%)	20(25%)	12(10%)	60(100%)

TCK refers to the teacher's knowledge of the interchangeable relationship between technology and content (Koehler, Mishra & Cain, 2013). It is simply the way content and technology influence and constrains one another (Mishra & Koehler, 2006, 2008). It characterizes the integration between what a teacher knows about applicable technological applications and about the topic of interest (MaKinster & Trautmann, 2014). The respondents have indicated that they lack the knowledge of the technological developments within their subjects.

Table 7. Student teachers' Technological Pedagogical Content Knowledge (TPACK).

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
1	I can use strategies that combine content, technologies, and teaching approaches that I learned about in my coursework in my classroom	3(11,7%)	10(18,3%)	17(35%)	19(25%)	11(10%)	60(100%)
2	I can choose technologies that enhance the content for a lesson	3(11,7%)	10(18,3%)	17(35%)	19(25%)	11(10%)	60(100%)
3	I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn	3(11,7%)	10(18,3%)	17(35%)	19(25%)	11(10%)	60(100%)
4	I can teach lessons that appropriately combine my teaching subject, technologies, and teaching approaches	3(11,7%)	10(18,3%)	17(35%)	19(25%)	11(10%)	60(100%)

Technological Pedagogical Content Knowledge (TPACK – pronounced "t-pack") is at the center of the above-mentioned knowledge bases. It is the latest form of knowledge and understanding that goes beyond the basic components of content, pedagogy, and technology, of teaching and learning (Mishra & Koehler, 2008; Koehler, Mishra & Cain, 2013). It involves the knowledge of the interaction between content, pedagogy, and technology (Mishra & Koehler, 2008; Koehler, Mishra & Cain, 2013). Data presented indicate that most of the respondents are still experiencing challenges with TPACK.

4. Conclusion

Looking at the above discussions and analysis of the findings as based on the research questions, the research draws the following conclusions. It seems CUT not equipping student teachers with adequate ICT integration skills, as a result, student teachers might have to cope with the demands of the digital education environment in COVID -19 times.

As a result of this problem, this paper proposes that student teachers be afforded in-service training immediately after completing their teacher qualifications. In-service training should be largely based on TPK, TCK, and TPACK.

References

Department of Basic Education. 2015. *Action plan to 2019: Towards the Realisation of Schooling 2030*. Pretoria: Government Printers.

Department of Basic Education. 2018. *Professional Development Framework for Digital Learning: Building Educator Competencies in Facilitating Learning with Digital Tools and Resources*. Pretoria: Government Printers.

Graham, C. R. 2011. Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*, 57(3), 1953-1960.

Guillén, I, Cuellar, M & Alfaro, F. 2020. Using technologies in 21st Century; COVID-19 as an acceleration factor to virtualize the world. *International Journal of Innovative Science and Research Technology*.5(8), 307-309

Koehler, M.J., Mishra, P. & Cain, W. 2013. What is technological pedagogical content knowledge (TPACK)? *Journal of Education*, 193(3), 13-19.

Lake, R. & Dusseault, B. 2020. School systems make a slow transition from the classroom to the cloud. Centre for Reinventing Public Education. http:/www.crpe.org/thelens/remote-classes-are-session-more-school-districts-attendance-plans-are-still-absent (b April 03)

MaKinster, J. & Trautmann, N. 2014. The Nature of Teacher Knowledge Necessary for the Effective Use of Geospatial Technologies to Teach Science. In, J. MaKinster, N. Trautmann & M. Barnett (Eds). *Teaching Science and Investigating Environmental Issues with Geospatial Technology: Designing Effective Professional Development for Teachers*, 333 - 353. New York: Springer Science+Business Media.

Mishra, P. & Koehler, M. J. 2006. Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 10-17.

Mishra, P. & Koehler, M. J. 2008. Introducing technological pedagogical content knowledge. In, *Annual Meeting of the American Educational Research Association*, March 1-16.

Shulman, L. S. 1986. Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.

Shulman, L. 1987. Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1-23.