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Pre-Service TVET Teachers' Perceptions of their Readiness to Integrate ICT In the Curriculum

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Abstract

The Jamaican Government with support from UNESCO have begun the implementation of the Information and Communications Technology Competency Framework for Teachers (ICT-CFT). A new ICT-CFT Curriculum has been developed from this framework and is currently being piloted at the University of Technology, Jamaica. This study was conducted among the pilot group of pre-service teachers to determine their perceptions of the impact of this new course of study on their abilities to integrate ICT in their specialist areas. Two research questions guided the study. A total of 30 pre-service TVET teacher, two lecturers and the educational technologist were purposefully selected for the study. The sample size was (n =33). A questionnaire and interviews were used to collect data. The findings showed that gender matters as it relates to the perceptions of pre-service TVET teachers and their readiness to integrate ICT in the curriculum. Males demonstrated a higher level of perceptions than their females. There was no difference in the perceptions of males and females towards their preparation to integrate ICT in the curriculum. Factors such as age group, prior exposure to ICT, and previous teaching experience, were not significant. The interview findings suggested that peer support and adequate technical support were among the factors that can impact the pre-service TVET teachers' mastery of integration of ICT in the curriculum. Recommendations were made on supporting the pre-service TVET teachers, modeling effective technology integration, promoting self-efficacy, and observing the pre-service TVET teachers during the practicum.

Keywords: Integration of ICT, pre-service TVET teachers, curriculum, TPACK model

Introduction

In recent times, the integration of Information and Communication Technologies (ICT) in the curriculum has been quite topical in Jamaica, the Caribbean, and the world at large. Such conversation is fueled by the notion that digital tools such as computers, mobile tools, projection systems, software, and the Internet are now conceived as 'basic infrastructure' within schools (Ruggiero &Mong, 2015). Many institutions at different levels are now forced to make provisions for the Millennials by ensuring that teachers are adequately prepared to adequately engage the students using modern techniques and methodologies. The increased access to ICTs in schools and the need to satisfy the interests of the Millennials has resulted in an expectation that technology-enhanced teaching will improve learning outcomes for these students (Barreto&Orey, 2014; Hew & Brush, 2007; Koc&Bakir, 2010;

Laferrière, Hamel, &Searson, 2013). Technology integration has, therefore, become a basic job requirement for teachers in contemporary society (Lawless & Pellegrino, 2007; Ruggiero &Mong, 2015; Teo, 2011).

In its response, the Government of Jamaica with support from UNESCO has begun the implementation of the ICT Competency Framework for Teachers (ICT-CFT) to improve teacher's ability to integrate technology in the curriculum. A new ICT-CFT curriculum has been developed based on this framework to replace the existing curriculum in all teacher training institutions. The curriculum is designed to equip teachers with the requisite knowledge and competencies to integrate ICT in the curriculum.

The University of Technology (UTech), Jamaica (UTech, is currently piloting the new ICT-CFT curriculum among pre-service TVET teachers. It is anticipated that the pre-service teachers will adopt the constructivist model and acquire competencies for integrating ICT across the components of the 21st learning environment.

Statement of the Problem

The demands of the 21st century related to the acquisition of ICT competencies by professionals in practically every industry is one reality facing educational institutions. Both pre-service and in-service teachers are now expected to demonstrate the necessary competencies to integrate ICT into the curriculum while educating pupils to become proficient in using ICT tools and application (Griffin, McGaw &Care, 2012). In response to this reality, many teacher training institutions have included introductory ICT courses in their curriculum, specifically designed to improve on the development of ICT knowledge and skills of the teachers in training (Polly, Mims, Shepherd &Inan, 2010). There are concerns, however, that preservice teachers are not ideally prepared to effectively integrate technology into their classrooms (Ottenbreit-Leftwich, Glazewski, Newby&Ertmer, 2010; Tondeur et al., 2012), specifically due to a gap between their technical ICT skills and the knowledge of the good pedagogical practice.

The review of the literature showed that a lot of studies have been done on the a integrate ICT into the curriculum and the acquisition of ICT competencies (Griffin, McGaw &Care, 2012; Polly, Mims, Shepherd &Inan, 2010; Ottenbreit-Leftwich, Glazewski, Newby&Ertmer, 2010; Tondeur et al., 2012). However, there is limited literature on the readiness of pre-service TVET teachers. Therefore, there is a need to investigate how ready and willing the pre-service TVET teachers are to incorporate ICT into the curriculum.

Purpose of the Study

The main purpose of this study was to investigate pre-service teachers' perceptions of their readiness to integrate ICT in the curriculum at UTech, Jamaica, and therefore providing important information to guide the piloting of the new ICT for Educators 1 programme.

Research Questions

The following questions guided the study:

1. How does the gender of pre-service TVET teachers' influence the perceptions of their ability to integrate ICT in the curriculum?
2. What are some of the factors that are related to the perception of pre-service TVET teachers as they seek to integrate of ICT in the curriculum?

Theoretical Framework

Following the review of several theoretical frameworks, the Technology Acceptance Model (TAM) and the Technological, Pedagogical, and Content Knowledge (TPACK) Model were used based on their relevance to the study. See Figure 1 and 2, respectively for the illustration of the two models.

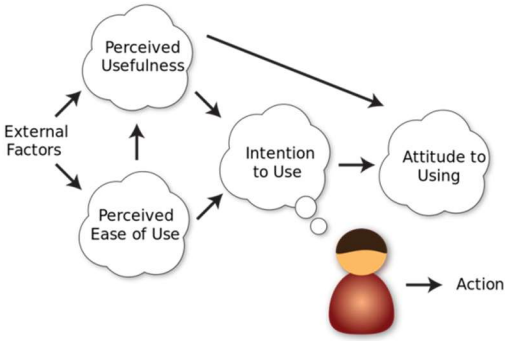

Figure 1. Technology Acceptance Model (Adapted from Davis, 1989)

The TAM was designed by Davis (1989) to determine the attitude of users towards using technology, which influences their behavioural intention to use technology (Ghavifekr& Wan Rosdy, 2015). The model consists of two variables, perceived usefulness and perceived ease of use, which determines one's attitude towards using technology.

- Perceived usefulness (PU) – refers to how the user believes that the technology will help to improve the performance/efficiency.
- Perceived ease of use (PEOU) – defined as the extent to which the user is comfortable in using the features of the technology (Ghavifekr& Wan Rosdy, 2015).

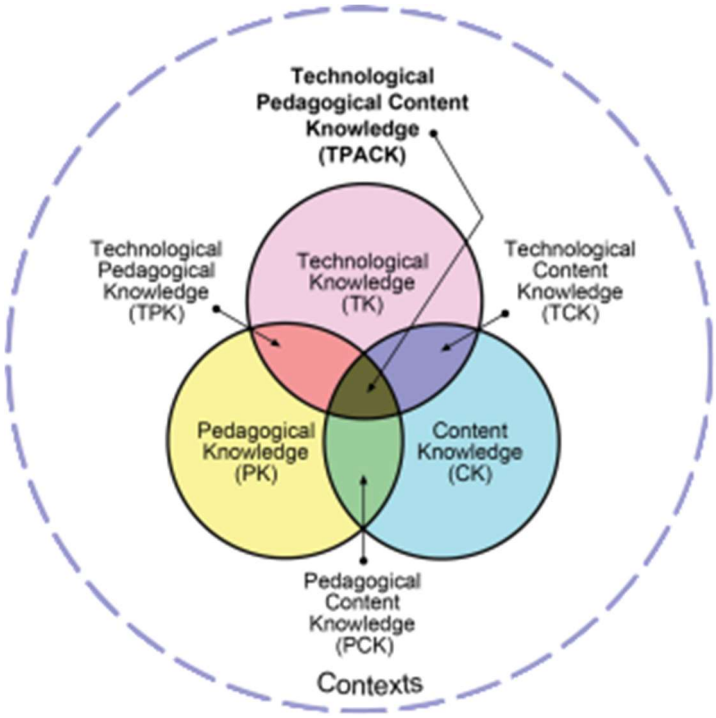

Figure 2. Technological, Pedagogical, and Content Knowledge Model (Adapted from Chai, Koh& Tsai, 2013)

According to Mishra and Koehler (2006), the TPACK Model is derived from three key knowledge sources, technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). TK, PK, and CK are integrated into the model to describe the foundation for effective integration of ICT in the curriculum. The TPACK framework has been used to re-design teacher education programs, specifically to determine the effectiveness of the design of these programmes (Chai, Ling Koh& Tsai, 2010). TPACK can also serve as a

measurement of instructors' knowledge, their practices, and the ability to effectively integrate technology in the classroom.

Delimitations and Limitations of the Study

The study only focused on one tertiary institution (UTech, Jamaica), and just the perceptions of the pre-service TVET teachers were sought. As a result**,** some caution must be taken in making generalizations based on the findings of the research, since limitations and delimitations are applicable.

The following limitations were observed: (a) the population of the study was restricted to 26 since only a single group of students selected the course of study, (b) the questionnaire did not provide the participants with opportunities to qualify their answers, (c) in the mixed-methods case study, there was the possibility that the interpretation of the qualitative data analysis could be influenced by the research's own beliefs and personal philosophy.

Significance of the Study

This study is therefore significant as it seeks to determine the perceptions of a group of pre-service TVET teachers towards their readiness to integrate ICT in the curriculum at UTech, Jamaica. Additionally, the information garnered from this study can be useful to all teacher training institutions in their preparation of both pre-service and in-service TVET teachers to integrate ICT in their specific discipline, as well as to inform policy.

Literature Review

The emergence of digital technologies as major derivatives to achieve successful integration of ICT into the classroom poses a substantial challenge to many pre-service TVET teachers (Abbitt, 2011; Kivunja, 2013). While successful integration might already be the norm for low-tech tools (e.g., non-digital classroom technologies such as pencils, notebooks, and overhead projectors), digital tools may provide teachers with more challenges because of their uncertainty or unfamiliarity with the tools (Barreto&Orey, 2014; Gilakjani, 2013). Preparing pre-service teachers to integrate technology effectively is a meaningful goal, since working with ICT tools and applications in an instructional context can often pose challenges for experienced teachers, more so novice teachers (Copriady, 2014; Lawless & Pellegrino, 2007; Pegler, Kollewyn, & Crichton, 2010; Richardson, Ertmer, Aagard, Ottenbreit, Yang, & Mack, 2008).

Research indicates that inexperienced teachers joining the ranks of practicing educators are no better at technology integration than their more experienced peers (Albion, 2011; Bate, 2010; Ertmer&Ottenbreit-Leftwich, 2010; Pegler et al., 2010; Yong, Gates, & Harrison, 2016). It is further observed that novice teachers may actually be worse than veterans at technology integration, due to their ongoing development in the area of pedagogical knowledge (Gilakjani, 2013; Martin, 2011). The challenge facing many of these novice teachers is that they are expected to be naturally inclined to use technology, and are also required to easily integrate technology into their teaching (Bate, 2010; Pierson &Cozart, 2005; Southall, 2013).

The New Realities Facing Teacher Training Programmes

There is a new school of thought emerging that for the preparation of pre-service teachers to effectively integrate technology in teaching, a rethinking of the approach used is necessary (Lambert & Gong, 2010; Ottenbreit-Leftwich et al., 2010; Wang & Chen, 2007). There is a belief that some pre-service teachers do not have enough exposure to the pedagogical use of ICT, and their expertise in working with computers and other educational technologies is no guarantee that they are adequately prepared for the integration of technology ICT (Brown &Warschauer, 2006; Lim et al., 2013). Understanding how pre-service teachers develop the competencies to effectively integrate technology is fast becoming a necessity in the design and development of teacher education programmes (Amiel, Kubota & Wives, 2016). Excellent teacher preparation programs are therefore judged on how they foster the development of teachers' integration skills on the basis of the technologies involved, the

pedagogical methods needed, and the contextualizing of this integration within their content area (Abbitt, 2011; Mishra & Koehler, 2006; Polly, 2014).

Teacher preparation programs must, therefore, incorporate strategies that determine how the pre-service teachers become acquainted with educational technologies. Approaches such as the modeling of technology integration should be available for teacher educators. Kay (2006) conducted a meta-analysis which described ten different approaches necessary for developing technology integration strategies among pre-service teachers. The analysis identified these approaches as: 1) integrating technology into all courses, 2) using multimedia (e.g., video case studies), 3) developing the education faculty members' skills so that they can integrate technology into their teaching, 4) a stand-alone technology course, 5) modeling effective use of technology, 6) collaboration between colleges and K-12 schools, 7) field-based learning, 8) targeted workshops, 9) improving access to educational technologies, and 10) partnering pre-service teachers with mentor teachers. Kay (2006) noted that some institutions use a combination of these different strategies concurrently.

Technology Self-Efficacy and Technology Integration

Pre-service teachers need opportunities to develop self-efficacy for teaching with technology that corresponds with their development of the competencies required for technology integration. Self-efficacy research indicates that teachers' beliefs and attitudes towards computers and other educational technologies can explain and even predict their use of technologies for teaching and learning (Abbitt, 2011; Perkmen&Pamuk, 2011). Researchers have indicated that, while specific competencies are certainly necessary, self-efficacy may be more important for teachers to display their knowledge and skills associated with educational technologies (Copriady, 2014; Ertmer&Ottenbreit-Leftwich, 2010; Gilakjani, 2013; Kramarski&Michalsky, 2015). Therefore, developing a sense of technology self-efficacy may be critical for effective technology integration. While computers are certainly not the only form of digital technologies available in schools today, much of the existing research bases focuses specifically on "computer self-efficacy" rather than "technology self-efficacy" more broadly.

Research Methodology

This study explored pre-service teachers' perceptions of their readiness to integrate ICT in the curriculum at UTech, Jamaica by using a mixed methods case study. The mixed-methods design consisted of the administration of a survey in the form of a questionnaire among the pre-service teachers and the interviewing of the lecturers of the ICT for Educators 1 course and the Educational Technologist.

A total of 30 pre-service TVET teacher, two lecturers and the educational technologist were purposefully selected for the study. The sample size was (n =33). All participants were anonymous and were informed of the purpose of the research and were given the option to participate in the study. The data collected were compared and related through a process of triangulation of results in order to create a trustworthy, credible account of the findings (Creswell, 2012).

The questionnaire data were analyzed through the use of the SPSS program, version 21. Due to the nature of the data collected and the sample size, descriptive statistics and the Mann-Whitney U Test were used to analyze the data collected through the use of the questionnaire. Qualitative descriptive analysis was used for the interviews.

Results

As shown in Table 1, there were more females in the study. A majority of the pre-service TVET teachers were between the age-range of 17to 20 years. Majority of the participants (39%) came from the Business Studies program. The areas of Mathematics and Administrative Management and Technology were least represented among the participants, with 19% and 15%, respectively.

Table 1: General Information Related to the Participants

Variable	Description	Quantity	
		(N)	(%)
Gender	Male	10	38
	Female	16	62
Age Range	17-20 years	18	69
	Above 20 years	8	31
Area of Specialization	Business Studies	10	39
	Computer Technology	7	27
	Mathematics	5	19
	Administrative Management and Technology	4	15

Research Question One: How does the gender of pre-service TVET teachers' influence the perceptions of their ability to integrate ICT in the curriculum?

To answer the above research question, data were collected through the use of a questionnaire, and analyzed using descriptive statistics and Mann-Whitney *U* Test (see Tables 2 & 3).

Table 2: Cross-Tabulation of the Perceptions of Pre-service TVET Teachers by Gender

Variable	Gender	Number (N)	Mean
Perception	Male	10	18.30
	Female	16	10.50

Table 2 shows the results from the Mann-Whitney *U* Test conducted to evaluate the perception of male and female pre-service towards their readiness to integrate ICT would be the same. The results of the test indicated an acceptance of the alternate hypothesis since the male perception mean rank of 18.30 is higher than the female mean rank 10.50.

Table 3: Difference between Male and Female Perceptions

Variables	Mann Whitney *U*	Wilcoxon rank W	Z-score	R-value	*p*-value
Values	32.0	168	-2.54	-0.498	<0.05

Table 3 shows further results from the Mann-Whitney *U* Test illustrating that the results were found to be statistically significant with *U*at 32.00, Z at -2.54, and $p < 0.05$. The difference between the male and female pre-service TVET teachers' perceptions was -0.498. This showed that there is a difference in their perceptions about their preparedness to integrate ICT in the curriculum. This seemed to support the findings of the study done by Mahdi and Al-Dera (2013),Manyilizu and Gilbert (2015), and Mustafa (2015) that males showed better applications towards their readiness in preparation to integrate ICT in the curriculum.

Research Question Two: What are some of the factors that are related to the perception of pre-service TVET teachers as they seek to integrate ICT in the curriculum?

To answer the above research question, data were collected through the use of a questionnaire and interviews. The data from the questionnaire were analyzed using descriptive Mann-Whitney *U* Test as well as the Wilcoxon Rank W test (see Table 4).

Table 4: Comparison of Other Variables with Perception

Variables	Mann Whitney *U*	Wilcoxon Rank W	Z-score	R-value	p-value
Age Group	58.0	229.0	-0.781	0.435	<0.05
Prior exposure to ICT	35.0	56.0	-1.528	0.127	<0.05
Prior teaching experience	49.5	239.5	-0.987	0.324	<0.05

As shown in Table 4, there was no difference between the perceptions of male and female pre-service TVET teachers about their preparedness to integrate ICT in the curriculum when compared with factors such as their age group, prior exposure to ICT, and prior teaching experience. These results seem to be substantiated by Manyilizu and Gilbert (2015), Mustafa (2015), and Teo (2008) regarding the effects of factors such as age group, teaching experience and confidence on pre-service teachers' readiness to integrate ICT in the curriculum.

One of the most common themes gathered from the interviews conducted among the lecturers and educational technologist was that the new knowledge gained improved confidence, and varying competencies gathered by the participants during the course of study. These were characteristics identified in studies conducted by Ertner and Ottenbreit (2010), Kamalodeen, Figaro-Henry, Ramsawok-Jodha and Dedovets (2015), and Lang, Craig, and Casey (2016) as significant measures used to determine teachers' readiness to integrate ICT in the curriculum. Another dominant theme resulting from the coding process was that prior teaching experience contributed significantly to the participants' awareness of selecting ICT tools and integrating these tools in teaching tools in the curriculum. Aslan and Zhu (2018) identified pedagogical knowledge and perceived competence as significant predictors for starting teachers in their quest to integrate ICT in teaching.
Pedagogical knowledge (connected to technological knowledge as TPK and TPACK) and content knowledge (connected to both technological and pedagogical knowledge as TPACK) are both essential requirements required to achieve self-efficacy for technology integration.

Additionally, the participants in the study who were more advanced in using the ICT tools assisted those who lacked the competencies in this area. Aslan and Zhu (2018) identified peer support as another predictor for starting teachers to integrate ICT in their teaching. This support impacts the attitude towards using technology as described by the TAM model. The lecturers reported in the interviews that peer support contributed to the pre-service teachers becoming more comfortable integrating ICT tools in lessons.

The process of triangulation was used to corroborate the data collected from the questionnaire, interviews, and the course of study. The convergence of the results from the questionnaire and interviews was compared to the course objectives/description. The participants demonstrated elements of the constructivist approach, acquired some competencies require to integrate ICT in the curriculum, and improvements in their confidence towards integrating ICT tools in the curriculum. These fundamental capabilities of the pre-service teachers were measures of their abilities to integrate ICT in the curriculum, as described by the TPACK model. Of note is the presence of the constructivist approach and the values of confidence of the pre-service teachers in the course of study as significant outcomes that these teachers should achieve at the end of its implementation.

The findings related to pre-service TVET teachers' perceptions of their readiness to integrate ICT in the curriculum, provide evidence to answer the research questions for this study, and are corroborated by the existing literature related to pre-service teachers' self-efficacy and technology integration.

Conclusion

In the context of the piloting, a new course of study relating to the integration of ICT in the curriculum, the findings of this study is rather significant in the analysis of the preparedness of pre-service TVET teachers to integrate ICT in the curriculum. The research findings indicated that re-service TVET teachers do perceive themselves as being able to utilize ICT tools and applications and also integrate these tools as required by the course of study. In an effort fully support the pre-service TVET teachers, exposure to different learning experiences is vital to their training. These experiences include both vicarious and enactive learning experiences

to allow pre-service teachers to learn about technology integration through modeling, and enactive learning experiences to impact their learning experiences directly related to technology integration.

Recommendations

Based on the findings, the following recommendations are made:

1. Support for the Pre-Service Teachers. In an effort to ensure that adequate support is provided for the pre-service teachers, institutions should provide the services of at least one educational technologist to assist the teachers. The presence of the technologist will be of significant assistance to the pre-service teachers who enter the training without prior teaching experience. The teachers should have access to the services of the technologist outside of scheduled classes as well as during classes.
2. Modeling Effective Technology Integration. While the services of an educational technologist are available to the pre-service TVET teachers, opportunities for those with prior teaching experience to assist others without experience should be a feature of the engagement during the training. This would allow the pre-service TVET teachers to share vital experiences while maximizing the benefits of the constructivist approach.
3. Promote Self-Efficacy among Pre-Service Teachers. During their training, the pre-service teachers should be assisted in developing their self-efficacy for technology integration through enactive experiences connecting technology and pedagogy within content areas. The teachers could harness their different areas of relative strength in integrating ICT in their specialized areas as well as and addressing their relative weakness while in training. This could also impact improvements in their confidence in integrating ICT in the curriculum.
4. Observation of Pre-Service Teachers during Practicum. It will become necessary to make adjustments to the current practicum instrument used to assess the pre-service teachers during their practicum to accommodate the integration of ICT. This adjustment will provide greater opportunities for the assessment of pre-service TVET teachers' integration of ICT in their specific disciplines.

Future Research

It would be valuable to replicate this study at other teacher training institutions to facilitate the corroboration of the findings of this research. Specific areas that could be targeted for further research could include:

i. The main predictors that are related to pre-service TVET teachers' perceptions of the integration of ICT in teaching.
i. Observation of pre-service TVET teachers integrating ICT in teaching during the practicum.
ii. A longitudinal study to determine the impact of the new ICT in Education Course of Study on the pre-service TVET teachers' ability to integrate ICT in their teaching during their Teaching Practicum.

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