

Pre-Service Teachers' Self-Efficacy Beliefs Towards Educational Technologies Integration in Tanzania

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Abstract: This study examines pre-service teachers' (N = 386) self-efficacy beliefs towards educational technologies integration in the classroom at the two colleges in Tanzania that prepare secondary education teachers. Using regression analysis, the study found out that the determinants of self-efficacy beliefs among pre-service teachers towards educational technologies integration are support, perceived ease of use, performance expectancy, and social influence. The findings of this study enhance our understanding of factors that hinder teachers from integrating educational technologies into the classroom.

Keywords: Self-Efficacy, Educational Technologies, Pre-Service Teachers, Educational Technology Integration

Introduction

Enhancing technological integration in education is one of the pivotal issues in Tanzania today, as the country envisions leaping towards being a middle-level income earner and a semi-industrialized country by 2025 (MWTC, 2016). As a result, the government and other stakeholders have been making considerable investments to ensure that secondary schools have the necessary ICT infrastructure as well as e-content that can be used to improve the quality of education. However, relatively few teachers have been integrating educational technologies into the classroom environment (Andersson, Nfuka, Sumra, Uimonen, & Pain, 2014; Kafyulilo, Fisser, Pieters, & Voogt, 2015; Kihoza, Zlotnikova, Bada, & Kalegele, 2016; UNESCO, 2015).

This fact is unsettling given the fact that, in many universities in Tanzania, educational technologies are integrated into pre-service teachers' training programs. The pre-service teachers are often trained on technical skills as well as on how to employ them in the classroom. Moreover, a large percentage of current students are becoming increasingly competent and skillful with various educational technologies. It is therefore expected that teachers' skills in using these technologies for enhancing teaching and learning in these schools should match that of their students.

Studies conducted in Tanzania have identified extrinsic factors such as lack of computers, poor Internet connectivity, inadequate training and support, and lack of time as barriers for teachers to integrate educational technologies into the classroom (Lwoga, 2012; Mtebe, Mbwilo, & Kissaka, 2016). Nevertheless, intrinsic barriers such as computer self-efficacy beliefs are described as being more influential than extrinsic ones in teachers' decisions to use technology (Ertmer, Ottenbreit-Leftwich, & York, 2007).



Bandura (1977) defines self-efficacy as the strength of one's beliefs in one's own ability to complete tasks and reach certain goals. Bandura adds that self-efficacy is not concerned with the skills an individual has but with the judgments of what one can do with whatever skills one possesses. Such individuals will tend to prefer and enjoy behaviors which they feel they are capable of performing compared to those with lower self-efficacy beliefs (Abbitt, 2011). Therefore, effective classroom technology integration depends on teachers' beliefs of having sufficient ability to adopt and use them in classroom (Chen, 2004; De, Uçar, & Demir, 2014).

That is to say, pre-service teachers with higher technology self-efficacy beliefs are prone to use and integrate technology more into the classroom than pre-service teachers with lower self-efficacy beliefs. Therefore, understanding pre-service teachers' beliefs about educational technologies provides insight into how they are likely going to use them in a classroom environment in the future. This paper examines factors that influence pre-service teachers' self-efficacy beliefs towards educational technologies' integration into the classroom in Tanzania. The study was conducted in two university colleges: Dar es Salaam University College of Education (DUCE) and Mkwawa University College of Education (MUCE), with a sample of 386 pre-service teachers.

Research Context

The government of Tanzania and other stakeholders have been making considerable efforts to embrace secondary schools with ICT infrastructure as well as installing various education technologies in a bid to improve the quality of teaching and learning. To ensure smooth deployment of educational technologies, the government has been making efforts to provide electricity to the majority of schools in the country. Currently, 30.4% (1,368) of schools are connected to National Grid Electricity (NGE), while 837 schools use solar power, 569 use generators, and the rest use biogas and wind power (URT, 2014).

Moreover, the government, through the Ministry of Education and Vocational Training (MoEVT), developed content for 70 topics and 147 subtopics of physics, chemistry, biology and mathematics, enhanced with various multimedia elements. The developed content has been shared to secondary school students via an online platform (www.shule.ac.tz). Students all over the country have been accessing the content through this system. The initiative also included the training of more than 2,000 teachers from 858 schools to be able to use the content to complement classroom delivery (Mtebe, Mbwilo & Kissaka, 2016).

Other firms that have complemented the government's efforts by developing e-content that can be used to improve the quality of teaching and learning in secondary schools in Tanzania include Christian Social Services Commission (CSSC, 2014), Brainshare, Shuledirect, and 21 ICT Solutions. The Brainshare firm developed content in English, mathematics, science and social studies in audio-visual format with animations. Similarly, Shuledirect developed content for Biology, Civics, Chemistry, English, Geography, History, Mathematics and Kiswahili (Mtebe & Kissaka, 2015). So far, there are more than 10,000 users registered in the system.

There are some efforts to equip secondary schools with computers as well as connecting them with the Internet in various regions in Tanzania. For instance, the Universal Communications Service Access Fund (UCSAF) equipped 1,000 teachers with laptops in 10 districts in rural areas. British Council Tanzania donated more than 700 computers in secondary schools in various regions in Tanzania

(British Council Tanzania, 2013). Similarly, Halotel supported 400 schools and Tigo supported 700 with computers connected to the Internet in selected regions of the country (Kazoka, 2016; Tanzania TELECOMS, 2016).

Given these initiatives, the majority of students in secondary schools are increasingly becoming competent and skillful with various educational technologies. It is therefore expected that teachers' skill in using these technologies to enhance teaching and learning in these schools could match that of their students. The situation is different as a larger number of teachers do not integrate them into classroom despite having graduated with knowledge and skills of using various educational technologies.

Therefore, there is a great necessity to understand factors that influence self-efficacy beliefs of pre-service teachers towards integrating educational technologies in the classroom. According to Giles and Kent (2016), pre-service teachers' technology self-efficacy belief is a creditable indicator of graduates' likelihood to use educational technology throughout their careers; thus, it is imperative that new teachers graduate with a high sense of self-efficacy regarding their abilities to use technology as an effective teaching tool.

Related Works

Technologies can profoundly affect what teachers choose to do, how they do it, and whether or not they have a chance at succeeding (Govender & Govender, 2009). Thus, self-efficacy beliefs are crucial in influencing teachers to use technologies in their daily teaching roles. For instance, Ball and Levy (2008) investigated the impact of self-efficacy, computer anxiety, and technology experience on instructor intention to use technologies in a small private university in the United States of America and concluded that self-efficacy was the only major determinant of teacher intention.

Teo (2009) examined the relationship between teachers' self-efficacy and intention to use technology using a sample of 1,094 pre-service teachers at a teacher training institute in Singapore. Teo found that teachers' self-efficacy beliefs had a direct effect on pre-service teacher's perceived usefulness, perceived ease of use, and behavioral intentions. Curts, Tanguma, and Peña (2008) also conducted a study to predict teachers' self-efficacy in using technology for pedagogical purposes using a sample of 438 teachers in a Hispanic school in Texas. It was revealed that teachers' self-efficacy beliefs had a direct influence on classroom technology integration.

Giles and Kent (2016) conducted their study using 28 pre-service teachers at a university's college of education in the United States to determine preservice teachers' self-efficacy beliefs related to integrating technology into instruction. Data indicated that almost all (93%) of the participants incorporated technology into the lessons they taught, with the majority (68%) of participants reporting a high level of confidence in their ability to select and utilize technology in teaching. Further, 89% of the participants felt they could integrate technology across the curriculum with 80% indicating they were capable of determining the why, when, and how to do so most of the time.

Likewise, Albion (2001) explored teachers' self-efficacy on classroom technology integration using a sample of 89 pre-service teachers and found that teachers with high self-efficacy beliefs had more classroom technology integration. The other profound revelation on the subject came from Abbitt (2011) in his study on self-efficacy beliefs in technology integration of pre-service teachers using Technological Pedagogical Content Knowledge (TPACK). The study was done using a sample of 45

pre-service teachers. Findings revealed that there was a strong positive correlation between self-efficacy and technology integration as predicted by TPACK domains.

These studies and many others from the literature clearly indicate that teachers’ self-efficacy beliefs have a significant influence on classroom technology integration and, thus, form a basis for this study. In Tanzania, however, the majority of existing studies that have investigated teachers’ barriers towards integrating technology into the classroom have been concentrated into extrinsic factors, such as lack of computers, poor Internet connectivity, and inadequate training and support (Lwoga, 2012; Mtebe & Raisamo, 2014). The majority of these factors have been overcome by the increasing support from the government and other stakeholders, which equips many schools with computers connected to the Internet. Still, the majority of teachers in secondary schools do not make use of these technologies in the classroom environment. This points to the need for examining intrinsic factors as barriers towards technology integration.

Research Model and Hypotheses

The study adopted factors from literature that could influence pre-service self-efficacy beliefs towards educational technologies integration into the classroom. These factors are shown in Table 1, followed by proposed research model in Figure 1.

Table 1: Factors that can influence teachers’ self-efficacy beliefs towards digital technology integration

No.	Factors	Source
1.	Performance Expectancy	Bandura, (1977)
2.	Social Influence	Bandura, (1989); Higgins & Compeau, (1995)
3.	Perceived Ease of Use	Albion, (1999)
4	Support	Higgins & Compeau, (1995)

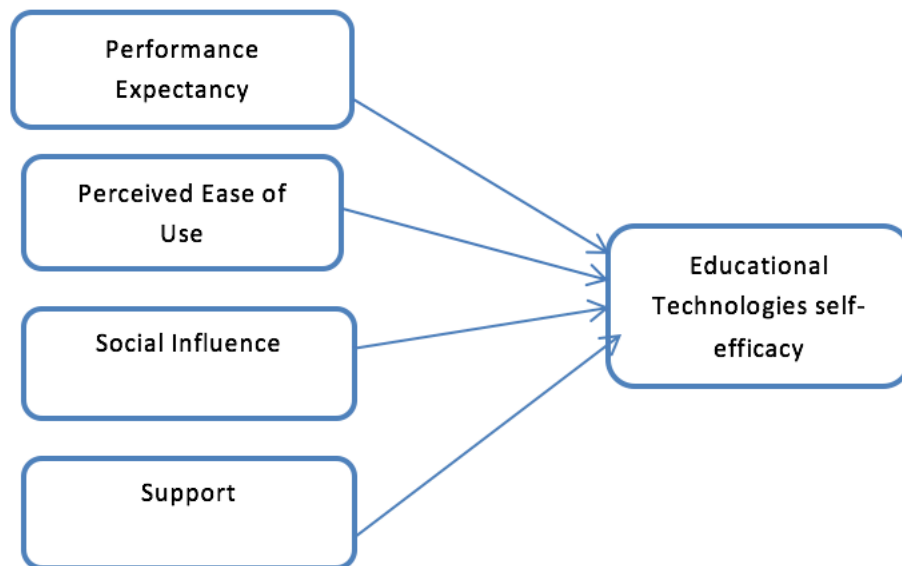


Figure 1: Proposed research model

The constructs and the hypotheses are described next.

Support

The availability of reliable support services to pre-service teachers has the potential to influence judgments on their capabilities to use educational technologies. Higgins and Compeau (1995) point out that the higher the support for using technology, the higher the individual's self-efficacy beliefs. Therefore, it is important to include support as one of the factors that can influence pre-service teachers to use the technology.

Hypothesis 1—Support has an effect on pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom.

Perceived Ease of Use

Perceived ease of use refers to the extent to which an individual believes that using a certain technology will be free of effort (Venkatesh, 2000). Rogers (1995) describes the attributes of the technology itself as one of the major factors affecting people's attitude toward new technology. Therefore, people who have a tenacious belief in their capabilities in using technology will persevere in their efforts despite innumerable difficulties and obstacles. In this way, the perceived ease of use will likely heighten self-efficacy beliefs, as it will lead to increased performance and accomplishments.

Hypothesis 2— Perceived ease of use has an effect on pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom.

Social Influence

Social influence is the extent to which users perceive what influential people close to them believe in the use of a particular technology (Venkatesh et al., 2012). According to Higgins and Compeau (1995), individuals rely on the opinions of others in forming judgments about their own abilities. Therefore, higher levels of technology integration among peers is likely going to increase other pre-service teachers' self-efficacy beliefs. When these pre-service teachers observe their peers use these technologies in the classroom successfully, they will become confident that they can similarly perform. Such beliefs are likely going to increase their self-efficacy towards using technologies in teaching.

Hypothesis 3—Social influence has an effect on pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom.

Performance Expectancy

Performance expectancy is defined as the degree to which users believe that using a certain technology will enable them to accomplish certain activities (Venkatesh et al., 2003). Bandura (1977) points out that individuals tend to persuade themselves that if others can do something, they should be able to achieve at least some improvement in the same type of performance. In the context of this study, self-persuasion represents the degree to which pre-service teachers believe that using educational technologies will enable them to perform teaching activities much better than before. Such kinds of beliefs are likely to increase their self-efficacy.

Hypothesis 4—Performance expectancy has an effect on pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom.

Methodology

Data Collection Instrument

Bandura (2006) argues that there is no all-purpose measurement of perceived self-efficacy and that, scales must be tailored to suit the specific context of a given study. Thus, items for each construct adopted from the literature were tailored to suit the context of this study as shall be explained. The instrument developed for this study uses a 5–point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree). Table 2 shows part of the data instrument used for data collection (excluding the demographics).

Table 2: The items construct

Construct	Code	Item
Performance Expectancy	PE1	I find educational technology useful in teaching
	PE2	Using educational technology enables me to accomplish teaching activities more quickly
	PE3	Using educational technology increases my knowledge in subjects I will teach.
	PE4	Using educational technology increases my skills for learning courses at college.
Perceived Ease of Use	PEoU1	My interaction with educational technologies is clear and understandable.
	PEoU2	Learning how to use educational technologies is easy for me.
	PEoU3	I find educational technologies easy to use
	PEoU4	It is easy for me to become skillful at educational technologies.
Social Influence	S11	People who influence my behavior will think that I should use educational technologies.
	S12	People who are important to me will think that I should use educational technologies.
	S13	People whose opinions that I value prefer that I use educational technologies.
Support	S1	The staff in the IT Unit provides support when using educational technologies.
	S2	The training provided by the IT Unit has enhanced my ability to use educational technologies.
	S3	The IT Unit staffs are competent with educational technologies.
	S4	The IT Unit staffs have adequate knowledge to help me if I experience any problems with educational technologies.
Teachers' Self-efficacy	TS1	I feel more competent with the educational technologies than most other people at college.
	TS2	I know enough about the educational technologies to get my teaching activities done.
	TS3	Compared to other people at the college, I know a lot about the educational technologies.
	TS4	I use the educational technologies as much as possible

Note. Scale labels: 1 – Strongly Agree, 2 – Agree, 3 – Neutral, 4 –Disagree, 5 – Strongly Disagree

Study Population and Data Collection

The study was conducted at DUCE and MUCE. These are two constituent colleges of the University of Dar es Salaam mandated to train pre-service teachers who are going to teach in secondary schools and teachers' training colleges. A total of 411 questionnaires were printed and self-administered to respondents. All respondents were guaranteed confidentiality and they were not required to fill in the name field.

A total of 386 out of 411 respondents returned the questionnaires. This was 93.9% of all respondents, whereby 39.4% (152) of respondents were from MUCE, and 60.6% (274) of respondents were from DUCE. The data collection was done between April and June 2016. Data were analyzed using Statistical Packages for Social Science (SPSS) version 20.

Reliability and Validity

Reliability is used to ensure the consistency of the results for the various items being tested within each component (Foster, 2001). It is normally evaluated by assessing the internal consistency of the items representing each construct using Cronbach's Alpha (Cronbach, 1951). Based on the SPSS results, the Cronbach alpha coefficient for the 19-item instrument was 0.906. According to Nunnally (1978), the value of Cronbach's Alpha should be positive and even greater than .700. As shown in Table 3, Cronbach Alpha value for seven constructs is above 0.700. Therefore, it can be concluded that the instrument used for this study was reliable. The overall questionnaire was considered valid as it used the same items from previous surveys.

Table 3: Cronbach's Alpha coefficients for construct reliability measurement

	Construct	Cronbach's Alpha
1.	Perceived ease of use	.811
2.	Performance expectancy	.738
3.	Social influence	.721
4.	Support	.785
5.	Teachers' self-efficacy	.752

Sampling Adequacy

The Kaiser-Meyer-Olkin Measure of Sampling (KMO) was used to measure the sampling adequacy of the data. According to Kaiser (1973), a KMO below .50 is unacceptable and factor analysis should not be performed. In this study, the KMO was .916, hence, confirmed the sampling adequacy. Moreover, Bartlett's test of sphericity, $p < .001$, indicated that the correlation between items was sufficiently large for performing the Principal Component Analysis (PCA).

Findings

Ownership and Use of Devices

Respondents were asked to indicate which devices they personally own. As expected, more than 90% of pre-service teachers indicated that they own mobile phones and nearly two thirds of respondents indicated they own laptops. Figure 2 shows the distribution of respondents who own devices.

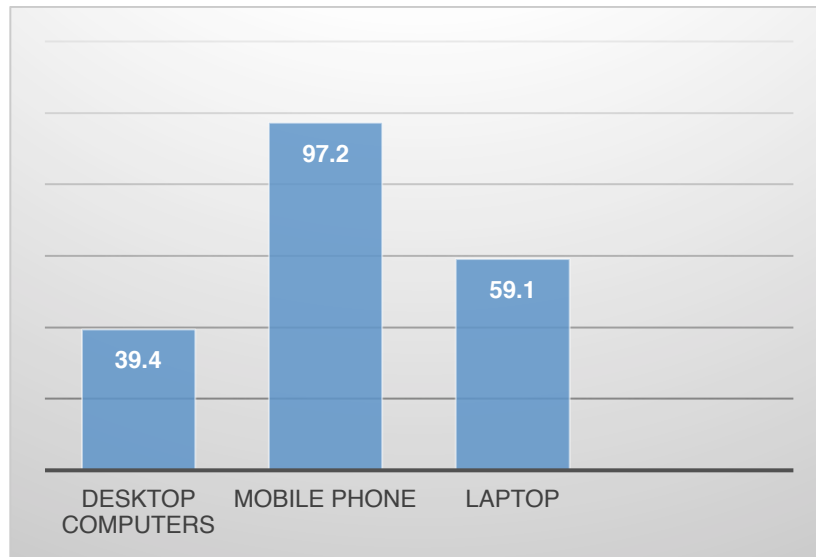


Figure 2: Distribution of respondents owning devices.

The study also found that 25.6% of respondents have access to desktop computers at the colleges. Relatively fewer pre-service teachers (0.8%) reported they use scanners. Figure 3 shows the distribution of respondents per usage of various devices at the college.

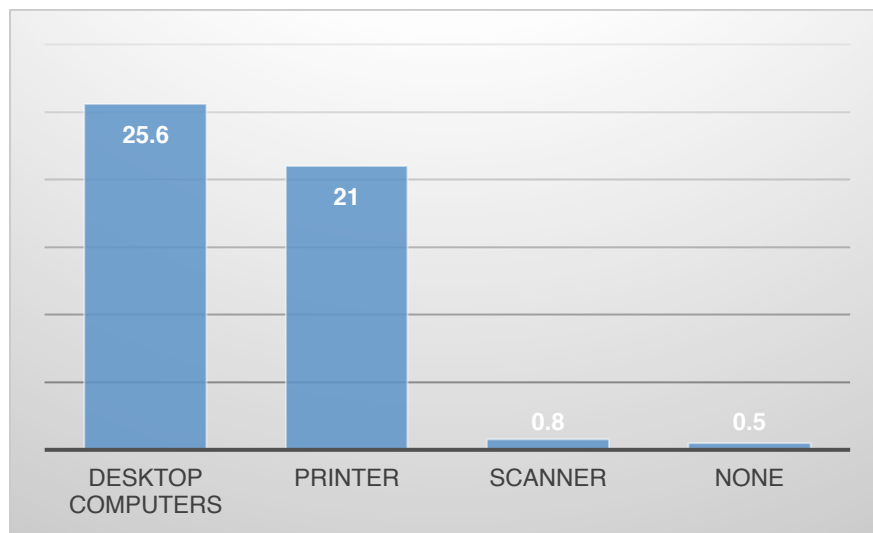


Figure 3: Distribution of respondents using various devices at the colleges.

Use Internet to Search Course Material

The study examined how pre-service teachers use the Internet to access course material. Interestingly, many respondents indicated that they use the Internet once per week (30.8%) or several times per week (36.5%) to access course material as illustrated in Figure 4.

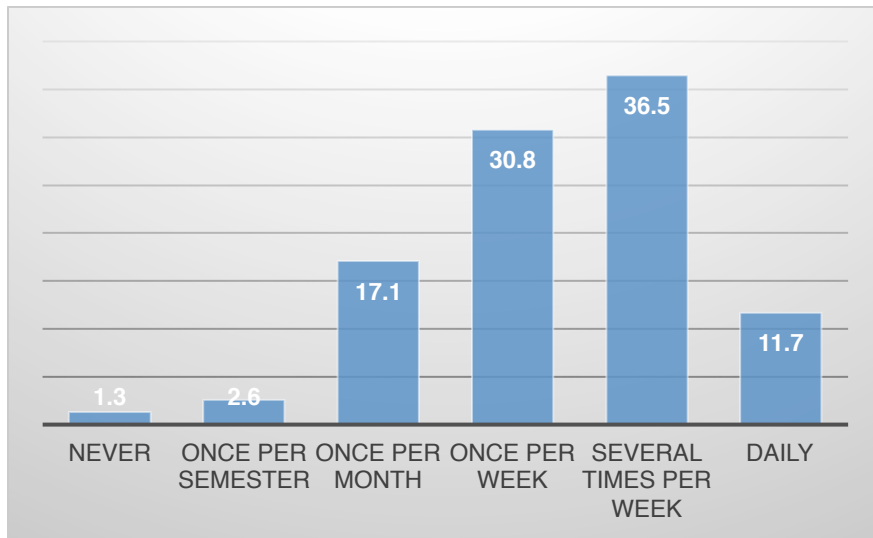


Figure 4: Distribution of respondents per usage of the Internet to access course material.

Hypotheses Testing

Identifying the Factor Structure

Factor Analysis (FA) was performed using the principal component analysis extraction method on 24 items using direct oblimin rotation with Kaiser normalization. The aim of the FA was to show whether the related items were clustered under the same construct or not. The minimum factor loadings should be .300 (Hair, Black, Babin, & Anderson, 2009). The loadings per each item are shown in Table 4. All items in the research instrument loaded successfully.

Research Model Summary

Four factors were subjected to linear regression analysis to measure the success of the model and predict causal relationship between the factors and teachers' self-efficacy beliefs. The four factors are perceived ease of use, performance expectancy, social influence, and support. Using the enter method, a significant model emerged: $F(4,381) = 39.535, p < .0005$. The model explains 28.6% of the variance (adjusted $R^2 = .286$) in pre-service teachers' self-efficacy beliefs towards educational technologies integration. Table 5 shows a summary of the research model.

Table 5 shows a summary of predictive factors in terms of beta values for each hypothesis obtained from regression analysis. The results show all factors were found to have significant effect on pre-service teachers' self-efficacy beliefs. The beta values are shown in Table 6.

A summary of how the hypotheses have been tested is shown in Table 6.

Table 4: Factor loadings on each construct

	S	PEoU	SI	PE	TS
PEoU1		-0.744			
PEoU2		-0.802			
PEoU3		-0.833			
PEoU4		-0.625			
PE1				0.839	
PE2				0.78	
PE3				0.496	
PE4				0.29	
SI1			-0.852		
SI2			-0.721		
SI3			-0.574		
S1	0.774				
S2	0.832				
S3	0.749				
S4	0.488				
TS1					0.637
TS1					0.787
TS3					0.772
TS4					0.624

Table 5: Summary shows the success of the research model

Model	R	R ²	Adjusted R ²	SE
	.542	.293	.286	.845

Note. SE = standard error of the estimate

Table 6: Unstandardized and standardized regression coefficients for the constructs

Construct	B	SE	b	P
S	.294	.05	.294	.000
PEoU	-.137	.05	-.137	.006
SI	-.115	.05	-.115	.023
PE	.184	.048	.184	.000

Table 7: Summary of results hypothesis testing

		Results	Conclusion
Hypothesis 1	Support has an effect on pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom.	$b = .294, p < .000$	Supported
Hypothesis 2	Perceived ease of use has significant effect on pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom.	$b = -.137, p < .05$	Supported
Hypothesis 3	Social influence has significant effect on pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom.	$b = -.115, p < .05$	Supported
Hypothesis 4	Performance expectancy has significant effect on pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom.	$b = .184, p < .000$	Supported

Note. Statistically significant values at $p < .05$ or $p < .001$

Discussion

Integrating technology into teaching is among the greatest challenges facing today's teachers. In Tanzania, the government and other stakeholders have been investing heavily in equipping secondary schools with computers connected to the Internet. Similarly, teachers have been equipped with skills to integrate these technologies into the classroom. Despite several existing initiatives, few teachers have been integrating them into the classroom environment. Existing studies have focused on investigating extrinsic barriers that hinder teachers from classroom technology integration (e.g., Andersson et al., 2014; A. Kafyulilo et al., 2015; UNESCO, 2015). This study focused on intrinsic barriers, specifically factors that influence teachers' self-efficacy beliefs towards educational technologies integration in the classroom.

In this study, four factors: support, performance expectancy, perceived ease of use, and social influence that can influence pre-service teachers' self-efficacy beliefs towards educational technologies integration in the classroom were assessed. Support was found to be the strongest predictor ($b = .294$). This implies that teachers believe that provision of support will increase their capabilities to integrate technologies in the classroom (Raphael & Mtebe, 2016). Albion (1999) describes such support to include several workshops over an extended period, training, and on-site support. Therefore, institutions and other stakeholders involved in teacher training should seek to provide continuous support services to pre-service teachers in order to increase their self-efficacy beliefs.

Performance expectancy was also found to have significant effect ($b = .184$) on pre-service teachers' self-efficacy in educational technologies integration. This means pre-service teachers believed that using these technologies would assist them in enhancing their teaching activities. According to Higgins and Compeau (1995), individuals would use technologies if they could see that there would be positive benefits (outcomes) in their activities. Rogers (1995) adds that new technologies will increasingly be used if potential adopters perceive that the innovation has an advantage over previous innovations and that the innovation has observable results. Therefore, institutions and stakeholders involved in teacher education should emphasize the value and potential of these technologies in improving learning outcomes. By doing so, pre-service teachers will see the importance of technology integration and therefore increase their self-efficacy beliefs.

The study also found that perceived ease of use had a negative significant effect ($b = -.137$) on pre-service teachers' self-efficacy beliefs in educational technologies integration. This finding suggests that the pre-service teachers believed that educational technologies are difficult to use. This finding is consistent with a study conducted on a sample of 1,137 teachers in Tanzania (Mtebe et al., 2016). The authors found that many teachers perceived that multimedia enhanced content was not easy to use for teaching. Therefore, the low usage of educational technologies in teaching could be due to teachers' own judgement that the technologies were difficult to use. Therefore, there is a need for institutions in Tanzania to integrate technology competencies into the curriculum for teacher education (Govender & Govender, 2009).

Another interesting finding was that social influence had a negative significant effect ($b = -.115$) on pre-service teachers' self-efficacy beliefs towards educational technologies integration. A possible explanation for this could be that teachers do not perceive that their colleagues could influence them to use educational technologies. According to Higgins and Compeau (1995), individuals rely on the opinions of others in forming judgments about their own abilities. It seems, therefore, teachers feel that their colleagues cannot influence them to use educational technologies as they themselves do not make use of them in teaching and learning.

Another finding from this study is that, despite the fact that many pre-service teachers have access to educational technologies, they have not integrated them into their classroom environment when they graduate. In this article, we found that 97% of pre-service teachers own mobile phones while 59% own laptops. This finding further supports the fact that extrinsic barriers are influential in hindering teachers from integrating technologies into the classroom. Therefore, the need to assess judgments about their capabilities and beliefs towards integrating these technologies in enhancing teaching and learning is important.

Conclusion and Suggestions for the Future

Educational technologies integration in the classroom is inevitable in the current generation of pro-digital technology students, and the constant changing technological environment in secondary schools. Unlike the past, most of students today enter school having knowledge of various technologies and skills in using them. It is therefore important to orient pre-service teachers with these skills, so that they integrate these technologies to enhance teaching as well as to provide education that meets the diverse learning styles of individual students in their professional careers. Therefore, this study was conducted on teacher trainees who are going to be teachers in the secondary schools in

years to come. Increasing the self-efficacy beliefs among these teachers will likely influence their pedagogical decisions and integrate these technologies in the classroom in future.

Despite findings from this study, some limitations are worth mentioning. The study was based on quantitative research methods measuring individual perceptions on teachers' self-efficacy beliefs with regard to the use of educational technologies for teaching and learning. Further research should be undertaken to complement the findings using qualitative research methods. Future research will help to answer some questions such as why teachers' own judgement is that the technologies were difficult to use, or why teachers do not perceive that their colleagues could influence them to use educational technologies. Despite this limitation, this study enhances our understanding of factors that hinder teachers from integrating educational technologies into the classroom.

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