THE RELATIONSHIP BETWEEN TEACHER EDUCATORS' TECHNOLOGICAL KNOWLEDGE AND THEIR SELF-EFFICACY IN EDUCATION DEGREE COLLEGES

Htay Hnin Yu[1] and Khaing Khaing Lwin[2]

Abstract

The purpose of this study is to investigate the relationship between technological knowledge and self-efficacy of teacher educators in selected Education Degree Colleges. In this study, the samples were (200) teacher educators from four Education Degree Colleges in Magway and Mandalay Regions. The Technological Pedagogical Content Knowledge (TPACK) developed by Ismail Sahin (2011) was used to measure teacher educators' technological knowledge. It comprised four dimensions: knowledge of technology, technological content knowledge, technological pedagogical knowledge, and technological pedagogical content knowledge. The second instrument was the Technology Proficiency Self-Assessment (TPSA C-21) developed by Christensen and Knezek, (2017) to investigate the self-efficacy of teacher educators. It had six scales: Email, WWW, Integrated Applications, Teaching with Technology, Teaching with Emerging Technologies, and Emerging Technologies Skills. Descriptive statistics was firstly used. In the technological knowledge of teacher educators, the mean of knowledge of technology was higher than that of other dimensions. In self-efficacy, the means of emerging technology skills was larger than that of other scales. According to the ANOVA results, there was a significant difference in technological knowledge and self-efficacy between teacher educators with 6-10 years of teaching experience and those with 11 years and above teaching experience. And the result of the Pearson-product moment correlation revealed that there was a significant and highly positive correlation between technological knowledge and the self-efficacy of teacher educators ($r = .876$, $p<.01$). According to simple linear regression, it can be predicted that 77% of teacher educators' self-efficacy can be predicted from their technological knowledge. Therefore this study indicated that the more technological knowledge teacher educators have the higher self-efficacy in their teaching-learning situation.

Keywords: Technological Knowledge, Self-efficacy, Technology Self-efficacy, Teacher Self-efficacy

Introduction

Today, the world is changing at the pace of amazing and these changes hit with the responsibility to bring up the innovations and reforms in education. So, teacher educators should own the technological knowledge to upgrade teaching-learning situations. The instructional process is the face-to-face teaching-learning process through tests, books, and documents at schools, education degree colleges, and universities. Nowadays, educational reforms have taken place in schools and education degree colleges, and it is needed new strategies to teach teacher educators to solve education issues effectively. Therefore, teacher educators need to train to have the technological knowledge to create the teaching-learning process and give logical solutions to real-life problems.

Statement of the Problem

Educational technology consists of all modern media, methods, and materials, and it is needed to use in a well-integrated manner. The more the use of technology in teacher education programs is, the higher the thinking skills of teacher educators on how to use technology. Empowering teachers to integrate technology into teaching and learning can improve instructional practice and better engage students. Mishne (2012) found that a relationship exists between

[1] Department of Methodology, Meikhtila Education Degree College
[2] Department of Curriculum and Methodology, Sagaing University of Education

teachers' self-efficacy and teacher technological knowledge to assist the development of a conceptual framework for encouraging and empowering teacher educators to use technology in the classroom. Teacher educators must have a chance to enhance technological knowledge on how to create and apply new information to their respective subjects. Thus, it is needed to find out the relationship between teacher educators' technological knowledge and their self-efficacy in Education Degree Colleges.

Purposes of the Study

The main purpose of this study is to find out the relationship between teacher educators' technological knowledge and their self-efficacy in the selected Education Degree Colleges. Specific objectives of this study are as follows:

1. To study the extent of technological knowledge and self-efficacy of teacher educators in the selected Education Degree Colleges
2. To investigate any differences in technological knowledge and self-efficacy of teacher educators according to teaching experiences in the selected Education Degree Colleges
3. To find out the relationship between teacher educators' technological knowledge and their self-efficacy in the selected Education Degree Colleges, and
4. To give suggestions on the application of technological knowledge and their self-efficacy.

Research Questions

The research questions of this study are as follows:

1. To what extent do the teacher educators have technological knowledge in the selected Education Degree Colleges?
2. How does teacher educators' technological knowledge differ according to their teaching experiences in the selected Education Degree Colleges?
3. To what extent do teachers educators have self-efficacy in the selected Education Degree Colleges?
4. How does teacher educators' self-efficacy differ according to their teaching experiences in the selected Education Degree Colleges?
5. How does teacher educators' technological knowledge related to their self-efficacy in the selected Education Degree Colleges?

Definition of Key Terms

This study is guided by the following definition of key terms.

Technological Knowledge: Technology knowledge refers to the knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the Internet, digital video, interactive whiteboards, and software programs (Schmidt, Baran, Thompson, Mishra, Koehler & Shin, 2009).

Self-efficacy: Self-efficacy is the belief that people have that they can be successful in any given task (Bandura, 1997).

Technology Self-efficacy*:* This concept is the belief individuals have in their abilities to successfully perform a technologically sophisticated new task (Laver, George, Ratcliffe & Crotty, 2012).

Teacher Self-efficacy

Teacher self-efficacy is defined as a judgment of one's own capabilities to bring about desired outcomes of student engagement and learning, even when students are difficult or unmotivated (Hoy & Spero, 2005).

Scope of the Study

The following points indicate the scope of the study.

1. This study is to investigate the teacher educators' technological knowledge and their self-efficacy in terms of teaching experiences in the selected Education Degree Colleges.
2. All teacher educators from Education Degree Colleges in Magway and Mandalay regions participated in this study.

Significance of the Study

The vast development of science and technology has happened in a short period. Various changes have occurred in the area of technology development and society's use of technology in daily life and the workplace. Therefore, in many classrooms, technological knowledge is a significant challenge for educators. Thus, technological knowledge is the important thing to explore the teacher educators' influence on how pre-service teachers can prepare for technology integration in education. The higher the technological knowledge of teacher educators, the higher their self-efficacy among teacher educators. That is why there is a relationship between teacher educators' technological knowledge and their self-efficacy. This study points out that teachers' self-efficacy may increase in how to apply technology to teaching situations if they have technological knowledge. In addition, understanding the relationship between technological knowledge and self-efficacy will facilitate the design of more effective teacher education programs. Thus, teacher educators need to have high technological knowledge. This study has the power to inform educational stakeholders about the ways to enhance the overall experience of educational technology for teacher educators.

Review of Related Literature

This study uses Piaget's (1952), Dewey's (1922) constructivism theories, and Bandura's social cognitivism (2012) in analyzing teacher educators' self-efficacy relating to 21st-century technology used to maximize student-teacher learning. This study presents a detailed analysis of the two theories to examine how the self-efficacy of teacher educators might help the incorporation of 21st-century technology in the classroom.

In this study, technological knowledge with the four components is used. In order to investigate technological knowledge supported by the education degree college, the TPACK framework developed by Ismail Sahin (2011) is used. The theoretical foundation of self-efficacy has six scales that measure teachers' confidence in integrating 21st-century technology tools in the classroom. In order to investigate self-efficacy supported by the education degree college, the TPSA C-21 Framework developed by Ropp (1999) is used.

TPACK Framework of Technological Knowledge

- *Knowledge of Technology*: is the third main area of knowledge (use of computers, peripherals, software). It refers to the technological competence of the student teachers, and their degree of familiarization with the use of computer environments for the design of educational activities (Angeli & Valanides, 2014).

- *Technological Content Knowledge*: refers to the knowledge of how technology can create new representations for specific content (Schmidt et al., 2009).
- *Technological Pedagogical Knowledge*: refers to the knowledge of how various technologies can be used in teaching, and to understanding that using technology may change the way teachers teach (Schmidt et al., 2009).
- *Technological Pedagogical Content Knowledge*: refers to the knowledge required by teachers for integrating technology into their teaching in any content area (Schmidt et al., 2009).

TPSA C-21 Framework for Self-efficacy

- *Electronic mail (e-mail)*: is a cost-effective and accessible communications tool. E-mail can integrate into a variety of classroom and independent learning situations (Hasset, Spuches, & Webster, 1995).
- *World Wide Web*: is a system of interlinked hypertext documents accessed via the Internet (Choudhury, 2014). One major feature of the World Wide Web that makes it valuable to educators is the fact that it functions as a huge database of information and resources: lesson plans, video clips, sound clips, photographs, and games that are readily available to the teacher who knows how to find them.
- *Integrated Applications*: can be defined as the usage of technology functioning as an integral or mediated tool to accomplish specific teaching or learning activities to meet certain instructional objectives. One way in which they could do this is by using readily available tools like spreadsheets. It is possible to manipulate the data using simple commands, create charts and graphs, reorganize the data in alphabetical or numeric order and work with the data using formulas (Lengen & Lenge, 2006).
- *Teaching with Technology*: motivates students to work independently whereas the student is more motivated to return to learning and working because modern technical equipment is widely available at any given moment (Lazar, 2015).
- *Teaching with Emerging Technologies*: In the emerging technology of education, one-to-one computing technology, sometimes abbreviated as "1:1" refers to academic institutions, such as schools or colleges that allow each enrolled student to use an electronic device in order to access the Internet, digital course materials, and digital textbooks (Bebell & Kay, 2010).
- *Emerging Technologies Skills*: The integration of emerging technologies in the teaching and learning process increases the interest of learners, and the quality of outcome in the educational process. Cloud Computing Technology is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet) (Oludipe, Fatoki, Yekini & Aigbokhan, 2014).

Research Method

Research Design

Descriptive research design was used to collect the required data in this study.

Procedure

Before field testing the instrument with a sample of teacher educators, validity for instruments was determined by the expert judgments. After getting the validity of these instruments, a pilot study was conducted. A sample of one Education College in Yankin Township was selected for pilot study.

The preliminary instrument was field tested with all teacher educators from that Education Degree College. In order to measure the reliability of the instrument, the Pearson product-moment correlation method was used for internal consistency reliability. The average coefficient of correlation for teacher educators' technological knowledge and their self-efficacy got high-reliability scores of 0.94 and 0.88. After taking permission from the responsible person, the questionnaires were distributed to four selected Education Degree Colleges located in Magway and Mandalay regions from 11th December 2021 to 25th December 2021 and collected after lasting 10 days. Data collected were listed by each education degree college. Based on the results of responses, this study was conducted in order to explore the technological knowledge of teacher educators and their self-efficacy.

Instruments

Data were collected from teacher educators of four selected education degree colleges by using the questionnaire. The questionnaire including two parts was developed by the researcher based on the related literature. In the first part of the questionnaire, 30 items that explored the technological knowledge of teacher educators were included and each item was rated on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). In the second part of the questionnaire, there were 30 items, which examined the teacher educators' self-efficacy and each item was rated on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

Population and Sample Size

The target population of this study was all teacher educators from four selected education degree colleges situated in Mandalay and Magway Townships. The samples were (200) teacher educators from four Education Degree Colleges in Magway and Mandalay Regions.

Data Analysis

Descriptive statistics such as mean and standard deviation were calculated for teacher educators' technological knowledge and their self-efficacy by using SPSS. In order to compare the technological knowledge and self-efficacy of teacher educators, the one-way analysis of variance (ANOVA) was conducted in terms of teaching experiences. Then, to be more specific, Post Hoc Multiple Comparison tests were used. Moreover, the Pearson product-moment correlation was used to investigate the relationship between technological knowledge and the self-efficacy of teacher educators. Data analysis and findings for this study will be thoroughly discussed in the next chapter.

Research Findings

Table 1 Descriptive Statistics of Teacher Educators' Technological Knowledge

Dimension	*N*	Minimum	Maximum	*M*	*SD*
Knowledge of Technology	200	18	75	50.49	11.18
Technological Pedagogical Knowledge	200	5	25	16.86	3.99
Technological Content Knowledge	200	5	25	16.09	3.80
Technological Pedagogical Content Knowledge	200	5	25	17.12	3.70

Table 1 described the means of teacher educators' technological knowledge in all selected education degree colleges.

Table 2 Means of Teacher Educators' Technological Knowledge in the Selected Education Degree Colleges

Dimension	EDC 1 (*n*=70)	EDC 2 (*n*=39)	EDC 3 (*n*=39)	EDC 4 (*n*=52)
Knowledge of Technology	51.51	48.85	51.15	49.85
Technological Pedagogical Knowledge	17.20	16.54	17.18	16.40
Technological Content Knowledge	16.33	15.72	16.08	16.06
Technological Pedagogical Content Knowledge	17.17	17.31	17.31	16.75
Average	**25.55**	**24.61**	**25.43**	**24.77**

Table 2 described the means of teacher educators' technological knowledge in all selected education degree colleges. The means of overall technological knowledge were (25.55) in EDC 1, (24.61) in EDC 2, (25.43) in EDC 3, and (24.77) in EDC 4, respectively.

Table 3 Descriptive Statistics of Teacher Educators' Self-efficacy

Dimension	*N*	Minimum	Maximum	*M*	*SD*
Email	200	5	25	17.73	4.22
World Wide Web	200	3	15	11.21	2.41
Integrated Applications	200	4	20	12.03	3.54
Teaching with Technology	200	6	30	19.82	4.79
Teaching with Emerging Technologies	200	6	30	19.72	4.60
Emerging Technology Skills	200	6	30	20.15	5.03

According to Table 3, the lowest mean was (11.21), and the highest mean was (20.15) respective in self-efficacy. It was found that teacher educators' self-efficacy on World Wide Web had the lowest mean values; teacher educators' self-efficacy in emerging technology skills had the highest mean values. It could be said that teacher educators have more self-efficacy in emerging technology skills than other scales.

Table 4 Means of Teacher Educators' Self-efficacy in the Selected Education Degree Colleges

Dimension	EDC 1 (*n*=70)	EDC 2 (*n*=39)	EDC 3 (*n*=39)	EDC 4 (*n*=52)
Email	17.90	17.36	17.85	17.71
World Wide Web	11.51	11.26	10.97	10.92
Integrated Applications	11.90	11.56	12.59	12.12
Teaching with Technology	20.09	19.23	20.15	19.67
Teaching with Emerging Technologies	20.14	19.59	19.10	19.71
Emerging Technology Skills	20.39	20.74	20.18	19.35
Average	**16.99**	**16.62**	**16.81**	**16.58**

Table 4 described the means of teacher educators' self-efficacy in all selected education degree colleges. The means of self-efficacy scales were (16.99) in EDC 1, (16.62) in EDC 2, (16.81) in EDC 3, and (16.58) in EDC 4, respectively.

Table 5 Means and Standard Deviations of Teacher Educators' Technological Knowledge in terms of Teaching Experiences

Variable	Teaching Experience	*N*	*M*	*SD*	Minimum	Maximum
Technological Knowledge	0-5 years	48	101.63	22.84	50	150
	6-10 years	38	108.39	22.09	33	146
	11years and above	114	97.49	19.47	44	135
	Overall	200	100.56	21.13	33	150

According to Table 5, the means of teacher educators' technological knowledge in terms of teaching experiences such as (0-5 years), (6-10 years), and (11 years and above) were 101.63, 108.39, and 97.49 respectively. The means of teacher educators' technological knowledge in teaching experiences 11 years and above teaching experience was the lowest, and 6-10 years of teaching experience was the highest.

In order to find out whether there were significant differences in teacher educators' technological knowledge according to teaching experiences, or not, one-way ANOVA was calculated (see Table 6). According to Table 6, a significant difference was among teaching experiences of teacher educators, F (2,197) = 3.99, p<.05. There was a significant difference in teacher educators' technological knowledge according to teaching experiences.

Table 6 ANOVA Results of Teacher Educators' Technological Knowledge in terms of Teaching Experience

Factor	Technological Knowledge	*SS*	*Df*	*MS*	*F*	*Sig.*
Teaching Experience	Between Groups	3460.575	2	1730.287	3.99	.02
	Within Groups	85436.820	197	433.689		
	Total	88897.395	199			

Post Hoc Comparisons (Tukey) were calculated to determine the technological knowledge of teacher educators according to the teaching experiences to be more specific. According to the result of Table 7, there was a significant difference in teacher educators' technological knowledge between the 6-10 years teaching experience of teacher educators and 11 years and above teaching experience of teacher educators. But there were no significant differences in technological knowledge between 0-5 years and 6-10 years by teaching experience of teacher educators as 0-5 years and 11years and above by teaching experience of teacher educators. So it can be concluded that the teacher educator's technological knowledge of 6-10 years of teaching experience was higher than 11 years and above teaching experience.

Table 7 Multiple Comparison for Teacher Educators' Technological Knowledge in terms of Teaching Experiences

(I) Teaching Experience	(J) Teaching Experience	Mean Difference (I-J)	Std. Error	*Sig.*
0-5 years	6-10 years	-6.770	4.522	.295
	11years and above	4.134	3.583	.482
6-10 years	0-5 years	6.770	4.522	.295
	11years and above	10.904*	3.901	.016
11years and above	0-5 years	-4.134	3.583	.482
	6-10 years	-10.904*	3.901	.016

Note. *The mean difference is significant at the 0.05 level.

According to Table 8, the means of teacher educators' self-efficacy in terms of teaching experiences were 18.55 (0-5 years), 22.30 (6-10 years), and 22.99 (11 years and above). The means of teacher educators' self-efficacy in 0-5 years of teaching experience was the lowest and 11 years and above of teaching experiences were the highest.

Table 8 Descriptive Statistics for Teacher Educators' Self-efficacy in terms of Teaching Experiences in the Selected Education Degree Colleges

Variable	Teaching Experience	*N*	*M*	*SD*	Minimum	Maximum
Self-efficacy	0 – 5 years	48	18.55	2.68	64	150
	6 – 10 years	38	22.30	3.62	54	145
	11years and above	114	22.99	2.15	39	149
	Overall	200	22.22	1.57	39	150

Again, in order to investigate whether there were significant differences in teacher educators' self-efficacy according to their teaching experiences or not, one-way ANOVA was calculated (see Table 9).

According to the result, there is a significant difference in self-efficacy among teaching experiences of teacher educators, F (2,197) = 4.11, p<.05. So, it was said that there was a significant difference in teacher educators' self-efficacy in terms of teaching experiences.

Table 9 ANOVA Results of Teacher Educators' Self-efficacy in terms of Teaching Experiences

Factor	Self-efficacy	*SS*	*Df*	*MS*	*F*	*Sig.*
Teaching Experiences	Between Groups	3931.695	2	1965.848	4.11	.018
	Within Groups	94285.500	197	478.607		
	Total	98217.195	199			

To investigate more specifically, Table 10 shows the result of the Post Hoc Comparisons (Tukey HSD) Test for teacher educators' self-efficacy differed in terms of teaching experience.

Table 10 ***Multiple Comparison for Teacher Educators' Self-efficacy in terms of Teaching Experiences***

Teaching Experience (I)	Teaching Experience (J)	Mean Difference (I-J)	Std. Error	*Sig.*
0-5 years	6-10 years	-2.794	4.750	.827
	11 years and above	7.531	3.764	.115
6-10 years	0-5 years	2.794	4.750	.827
	11 years and above	10.325*	4.098	.033
11 years and above	0-5 years	-7.531	3.764	.115
	6-10 years	-10.325*	4.098	.033

Note. *The mean difference is significant at the 0.05 level.

According to the result of Table 10, there was a significant difference in self-efficacy between the 6 to 10 years teaching experience of teacher educators and 11years and above teaching experience of teacher educators. But there were no significant differences in self-efficacy between 0-5 years and 6-10 years by teaching experience of teacher educators as 0-5 years and 11 years and

above by teaching experience of teacher educators. So it can be concluded that the teacher educator's self-efficacy of 6-10 years teaching experience was higher than 11 years and above teaching experience.

Table 11 ***Relationship between Teacher Educators' Technological Knowledge and Their Self-efficacy in the Selected Education Degree Colleges***

		Technological Knowledge	Self-efficacy
Technological Knowledge	Pearson Correlation	1	.876**
	Sig. (2-tailed)		.000
	N	200	200
Self-efficacy	Pearson Correlation	.876**	1
	Sig. (2-tailed)	.000	
	N	200	200

Note. **. *Correlation is significant at the 0.01 level (2-tailed).*

According to Table 11, there is a significant positive correlation at the 0.01 level (r = .876). The level of correlation has three stages that are low correlation (r = below .35), moderate correlation (r = between .35 and .65), and high correlation (r = above .65). The result showed that teacher educators' technological knowledge was significantly and high positively related to their self-efficacy. It means that the more teacher educators have technological knowledge, the higher self-efficacy in their teaching-learning situation.

Table 12 Model Summary for Teacher Educators' Technological Knowledge and Their Self-efficacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.876[a]	.768	.767	10.725

Note. a. Predictors: (Constant), Technological Knowledge Total

According to Table 12, the simple linear regression coefficient (R) = .876 and adjusted R square was .768. It can be seen that 77% of teacher educators' self-efficacy can be predicted from their technological knowledge. In Table 13, the results can be seen to get more exact information.

Table 13 Results of Simple Linear Regression on Teacher Educators' Technological Knowledge and Their Self-efficacy

Coefficients[a]

Variables	Unstandardized Coefficient		Standardized Coefficient β	*t*	*Sig.*
	B	Std. Error			
Constant	8.023	3.696		2.171	.031
Technological Knowledge	.921	.036	.876	25.609	.000***

Note. a. Dependent Variable: Self-efficacy Total, ***p < .001

Table 13 showed the teacher educators' self-efficacy significantly predicted their technological knowledge. Therefore, the model can be described as the following equation.

Teacher Educators' Self-efficacy = 8.023+.921Technological Knowledge

Responses of Open-ended Questions

Teacher educators have applied the knowledge of technology in everyday life. They used to communicate with each other by email, instant messaging (message, messenger, Viber, Twitter, and so on), and social networks (Facebook, Telegram, and so on). Among them, using the social network for sharing information, comments, images, etc. is the highest use of technology in the daily life of teacher educators. Teacher educator has self-efficacy for Google search to use and apply their technological knowledge in the workplace or classroom. In this study, 77 out of 200 teacher educators used Google search daily in their teaching-learning situation. Therefore, they are confident in finding teaching materials through Google search. Moreover, 48 out of 200 teacher educators get news or information by using technology in their everyday life. And they are confident in applying their technological knowledge to get information. Almost all teacher educators rarely shop online especially (teaching materials, books, travels, sports, clothes, and household items) using technology in this study.

Discussion, Suggestions and Conclusion

Discussion

Analyses of quantitative data collected from the study were performed to answer the five research questions. **Research question one**, it was found that teacher educators possess a higher knowledge of technology than other dimensions: technological pedagogical knowledge, technological content knowledge, and technological pedagogical content knowledge. Moreover, the means of teacher educators' technological knowledge in all selected education degree colleges (EDCs) were (25.55) in EDC 1, (24.61) in EDC 2, (25.43) in EDC 3, and (24.77) in EDC 4 respectively. It can be assumed that teacher educators have high knowledge of technology in all Education Degree Colleges. Teacher educators are weak in applying knowledge of technology in their teaching-learning situation because their technological content knowledge was lower than the other knowledge.

Next, in **research question two**, the findings described that there were significant differences in technological knowledge in terms of teaching experiences. Teacher educators were categorized into three groups by teaching experiences. This study revealed that teacher educators' technological knowledge who had 6 to 10 years of teaching experience was higher than those who had 11 years of teaching experience and who had 0 to 5 years of teaching experience. It can be assumed that teacher educators with 11 years and above teaching experience perform many additional activities (management, decision making, other duties and responsibilities), involving less in applying technological content knowledge. Teacher educators who have 0 to 5 years of teaching experience need the experience to connect with content knowledge and technological knowledge in their teaching-learning environment.

Again, **research question three** was to find out the extent of teacher educators' self-efficacy. According to the results, it was found that the teacher educators have more self-efficacy in emerging technology skills scale than on other scales: email, World Wide Web, integrated application, teaching with technological, teaching with emerging technology. Furthermore, in all selected education degree colleges, it was found that teacher educators are more confident of their abilities to use technology, collaborate with others, who are distant, and teach in a one-to-one environment with students who have their own devices and save and retrieve files from a cloud-based environment.

Research question four, according to the results, there were significant differences in self-efficacy in terms of teaching experiences. Teacher educators were categorized into three groups by teaching experiences. This study revealed that teacher educators who had 6 to 10 years of teaching experience were higher than 11 years and above teaching experience in their self-efficacy and who had 0 to 5 years of teaching experience. It is assumed that teacher educators of 11 years and above teaching experience perform many additional activities (management, decision making, other duties and responsibilities), and they involve less in applying technological content knowledge. The less they have technological knowledge, the less self-efficacy they have. Teacher educators who have 0 to 5 years of teaching experience have not got much or little teaching experience so their self-efficacy also decreases in their teaching-learning situation.

Research question five investigated the relationship between technological knowledge and self-efficacy at four selected education degree colleges. As the result of the Pearson-product moment correlation, it was shown that the directions of correlations were positive and there were very high significant correlations between teacher educators' technological knowledge and their self-efficacy. More specifically, the study can be reported that teacher educators with higher self-efficacy, more increased technological knowledge, and who have more teaching experience would integrate the technology into their classrooms more. If teacher educators got opportunities for integrating technology into the teaching-learning situation, they would increase more technological knowledge. Therefore, it is concluded that teacher educators increase technological knowledge and high self-efficacy in their teaching-learning situations.

Suggestions

Teacher educators are expected to improve and apply technological knowledge in their teaching-learning situation. Specifically, Education Degree College is the place where cultivate and train student teachers to become qualified teachers. As a result, teacher educators themselves must be equipped with a modernized teaching approach including technological knowledge. Therefore, Education Degree Colleges should provide the opportunities to promote teacher educators' technological knowledge and strengthen their effectiveness in their profession.

According to the results of this study, teacher educators should try to understand the accomplishment of their lesson objectives. Only then, their teaching is more integrated with technological knowledge and content knowledge. Besides, technological knowledge is applied in the teaching-learning process more effectively. The Ministry of Education should provide the required accessories and technological tools available within the 21st century to promote technological skills.

Conclusion

Self-efficacy can have an important effect on the quality of teaching and it can influence student achievement. Teacher educators should make an effort to increase their self-efficacy through the use of technological knowledge. A relationship exists between teachers' self-efficacy and teacher technological knowledge to assist in the development of a conceptual framework for encouraging and empowering teacher educators to use technology in the classroom (Mishne, 2012). Similarly, teacher educators should be trained through workshops and intensive ICT courses to improve their technological knowledge. To sum up, the outcome of this study suggests effective means for teacher education programs, skilled developers, and administrators.

In this study, the sample education degree colleges were selected in two regions. This research was a one-moment-in-time study. Therefore, it would be more beneficial to have a longitudinal study. Moreover, further research should be done to include other universities and schools. This study is conducted using only a quantitative approach. Therefore follow-up interviews should be undertaken to get the qualitative data for further research. Additional future research may include student interviews, asking them to share their experiences with technology in the classroom and their opinions on their teachers' technology integration.

Acknowledgements

We would like to especially acknowledge Dr. Myat Myat Thaw (Rector, Sagaing University of Education) who allowed us to do this study. Then, we are very grateful to Dr. Khin Hnin Yee (Pro-rector, Sagaing University of Education), and Dr. San San Lwin (Pro-rector, Sagaing University of Education) for their valuable expertise, professional guidance, and continuous encouragement and coaching which have enabled us to carry out this research up to this rightful conclusion. We would like to offer our respectful gratitude to Dr. Wai Wai Oo (Professor and Head, Department of Curriculum and Methodology, Sagaing University of Education) for her valuable comments and necessary editing for this paper. Most importantly, we also want to express our thanks to all participants in our study. We are indebted to all those who provided us with insightful suggestions. Finally, we are grateful to our beloved parents who give us opportunities to learn a valuable education.

References

Angeli, C., & Valanides, N. (Eds.). (2014). *Technological pedagogical content knowledge: Exploring, developing, and assessing TPCK*. New York, NY: Springer.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W. H. Freeman.

Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited [Editorial]. *Journal of Management, 38*(1), 9-44.

Bebell, D., & Kay, R. (2010). One to one computing: A summary of the quantitative results from the Berkshire wireless learning initiative. *Journal of Technology, Learning, and Assessment*, *9*(2), n2.

Choudhury, N. (2014). World wide web and its journey from web 1.0 to web 4.0. *International Journal of Computer Science and Information Technologies*, *5*(6), 8096-8100.

Christensen, R., & Knezek, G. (2017). Validating the technology proficiency self-assessment questionnaire for 21st century learning (TPSA C-21). *Journal of Digital Learning in Teacher Education*, *33*(1), 20-31.

Hassett, J. M., Spuches, C. M., & Webster, S. P. (1995). *Using electronic mail for teaching and learning*. To Improve the Academy. 333. Retrieved from https://digitalcommons.unl.edu/podimproveacad/333/

Hoy, A. W., & Spero, R. B. (2005). Changes in teacher efficacy during the early years of teaching: A comparison of four measures. *Teaching and teacher education*, *21*(4), 343-356.

Laver, K., George, S., Ratcliffe, J., & Crotty, M. (2012). Measuring technology self-efficacy: Reliability and construct validity of a modified computer self-efficacy scale in a clinical rehabilitation setting. *Disability and Rehabilitation, 34*(3):220-7.

Lazar, S. (2015). The importance of educational technology in teaching. *International Journal of Cognitive Research in Science, Engineering and Education*, *3*(1).

Lengen, G. J., & Lenge, K. M. (2006). *Integrating Technology: A Practical Guide*. New York: Person Education.

Mishne, J. (2012). *An investigation of the relationships between technology use and teachers' self-efficacy, knowledge and experience* (Doctoral dissertation, Pepperdine University).

Oludipe, O., Fatoki, O. K., Yekini, N. A., & Aigbokhan, E. E. (2014). Cloud-based E-learning platform: From the perspective of 'structure' and 'interaction'. *International Journal of Innovation and Research in Educational Sciences*, *1*(1), 1-6.

Ropp, M. M. (1999). Exploring individual characteristics associated with learning to use computers in preservice teacher preparation. *Journal of research on computing in education*, *31*(4), 402-424.

Sahin, I. (2011). Development of survey of technological pedagogical and content knowledge (TPACK). *Turkish Online Journal of Educational Technology-TOJET*, *10*(1), 97-105.

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers. *Journal of research on Technology in Education*, *42*(2), 123-149.