AN INVESTIGATION INTO TEACHER EDUCATORS' TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE ON THEIR SELF-EFFICACY

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Abstract

This study aimed to investigate teacher educators' technological pedagogical content knowledge on their self-efficacy. A sample of (160) teacher educators in five Education Degree Colleges were selected by using simple random sampling. The instruments for teacher educators' technological pedagogical content knowledge with (35) Likert scale items and the instrument for teacher educators' self-efficacy with (30) Likert scale items were applied. Survey method was employed to determine teacher educators' technological pedagogical content knowledge and their self-efficacy. The quantitative data were analyzed by using the Statistical Package for Social Science (SPSS). In order to examine the teacher educators' levels of technological pedagogical content knowledge and self-efficacy, descriptive statistics (mean and standard deviation) were used. The inferential statistics such as one-way analysis of variance (ANOVA) and Post Hoc test were used to compare teacher educators' technological pedagogical content knowledge and self-efficacy in terms of designation and teaching experience. Pearson-product movement correlation test was used to investigate the relationship between technological pedagogical content knowledge (TPACK) and self-efficacy. The findings pointed out that the teacher educators applied lower technological knowledge than pedagogical content knowledge in their teaching and learning and they had lower self-efficacy in adapting to individual student needs. The result showed that there was a positive relationship between teacher educators' technological pedagogical content knowledge and their self-efficacy at ($r = .677$, $p = .000$). Finally, this study revealed that the more the teachers have technological pedagogical content knowledge, the more they get higher self-efficacy.

Keywords: Technological Pedagogical Content Knowledge, Teacher Educators, Teacher Self-Efficacy

Introduction

Today, the technological pedagogical content knowledge (TPACK) competencies are needed for teacher-educators because they facilitate the prospective teachers to become techno-pedagogues. Technological pedagogical content knowledge provides teacher educators and teachers with a framework that guides them to achieve meaningful and authentic integration of technology into the classroom. Self-efficacy in a teaching context refers to the teachers' realization of their own capabilities and skills to bring about changes in learners' achievement in a positive way. In addition, highly self-efficacious teachers are more open to new ideas, have a greater commitment to teaching, and are more willing to adopt better teaching methods, and can significantly motivate the adoption of new technologies (Tschannen-Moran & Hoy, 2001).

Thus, teacher educators must have integrated knowledge from different domains including knowledge of student thinking, learning and effective teaching strategies, knowledge of the subject matter, and knowledge of technology for effective teaching that will be able to increase their self-efficacy (Bahriah & Yunita, 2019).

Purposes

The main purpose of this study is to investigate teacher educators' technological pedagogical content knowledge on their self-efficacy.

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The specific objectives are as follows:

- To examine the level of teacher educators' technological pedagogical content knowledge in terms of teaching experience and designation.
- To explore teacher educators' self-efficacy in terms of teaching experience and designation.
- To find out the relationship between teacher self-efficacy and technological pedagogical content knowledge.
- To give suggestions and recommendations based on the results of the study.

Research Questions

Based on the objectives, the research questions were described as follows:

- What are the differences between teacher educators' technological pedagogical and content knowledge in terms of designation and teaching experience?
- How do teacher educators differ on self-efficacy in terms of designation and teaching experience?
- What is the relationship between teacher educators' technological pedagogical content knowledge and self-efficacy?

Scope of the Research

The following points indicate the scope of the study.

- The research was conducted in five Education Degree Colleges out of twenty-five Education Degree Colleges in Myanmar.
- The number of participants in this study was (160) teacher educators from Mandalay, Magway, Meiktila, Pakokku Education Degree College and Taungyi Education Degree Colleges.

Definition of Key Terms

In this study, the definition of key terms are described as follows:

Technological Pedagogical Content Knowledge

Technological pedagogical content knowledge (TPACK) is the integration of knowledge between technology, pedagogy, and subject content which helps teachers to understand how the application can improve pedagogical practice and deeper understanding of subject content and curriculum (Mishra & Koehler, 2008).

Teacher Educators

Teacher educators are defined as people who provide instruction or who give guidance and support to student teachers and who thus render a substantial contribution to the development of students into competent teachers (Celik, 2011).

Teacher Self-efficacy

Teacher self-efficacy is teachers' confidence in their ability to promote students' learning (Hoy, 2000, cited in Ball, 2010).

Review of Related Literature

Conceptual Framework of Technological Pedagogical Content Knowledge

The technological pedagogical content knowledge (TPACK) framework was built by Shulman in 1986. This framework described pedagogical content knowledge to explain how teachers' understanding of educational technologies and pedagogical content knowledge interact with one another to produce effective teaching with technology. Shulman's PCK framework was developed by Mishra and Koehler in 2006 as the TPACK framework. The TPACK framework was constructed with three main elements namely; content knowledge, pedagogical knowledge, and technological knowledge. When these three main elements are integrated, new bodies of knowledge and professional practice become pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and technological pedagogical content knowledge.

According to Mishra and Koehler (2006), there are seven components in TPACK framework namely; technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK), and technological pedagogical content knowledge (TPACK).

Teacher Self-Efficacy

Teacher self-efficacy is vital for student success in the classroom. Teachers must have a strong judgment of their capabilities and their ability to plan, implement, motivate, and execute student achievement. Teachers must feel motivated to rise to the challenge of teaching.

According to Skaalvik and Skaalvik (2010), there are six components of teacher self-efficacy, self-efficacy in instruction, self-efficacy in adapting education to individual students' needs self-efficacy in motivating students, self-efficacy in keeping discipline, self-efficacy in cooperating with colleagues and parents, self-efficacy in coping with changes and challenges.

Research Method

Subjects

A sample of (160) teacher educators were selected in Mandalay Education Degree College, Magway Education Degree College, Meiktila Education Degree College, Pakokku Education Degree College, and Taungyi Education Degree College by using the simple random sampling method.

Design

In this paper, survey method one of descriptive research designs was used.

Instruments

The instrument for teacher educators' technological pedagogical content knowledge with (35) Likert scale items was constructed based on the questionnaires (Kazul & Erten, 2014) and the instrument for teacher educators' self-efficacy with (30) Likert scale items was constructed based on (Skaalvik & Skaalvik, 2010).

Procedure

Firstly, a pilot test was held with thirty teacher educators at Sagaing Education Degree College in October 2021. Based on the findings of the pilot test, the internal consistency

reliability of the questionnaires was determined by Cronbach's Alpha (.832 and .857) respectively. After pilot testing, the major survey was conducted in November 2021.

Data Analysis

The Statistical Package for the Social Science (SPSS) was used to analyze the quantitative data. The data were analyzed by using descriptive statistics, one-way analysis of variance (ANOVA), Post Hoc test and Pearson-product movement correlation test.

Findings

Descriptive Statistics of Teacher Educators' Technological Pedagogical and Content Knowledge on each Dimension

Table 1 Mean and Standard Deviation of Teacher Educators' Technological Pedagogical and Content Knowledge

Dimension	*N*	*M*	*SD*
D1	160	17.00	3.391
D2	160	19.86	1.886
D3	160	19.46	2.160
D4	160	18.59	2.496
D5	160	20.08	1.780
D6	160	18.85	2.842
D7	160	18.89	2.495

Note. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge

Based on the results, the mean of pedagogical content knowledge was the highest (20.08) and technological knowledge had the lowest mean (17.00) (see Table 1). To see obviously, the level of means for each dimension was illustrated in Figure 1.

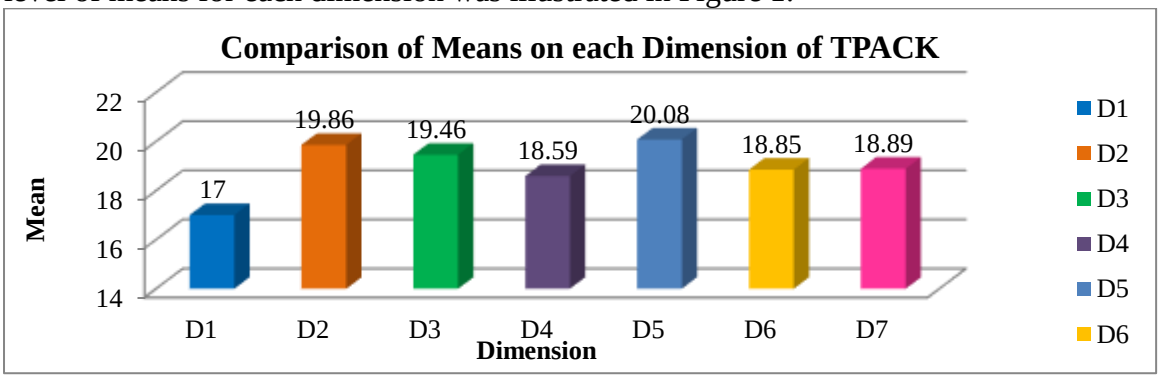

Figure 1 Comparison of Means on each Dimension of TPACK

Note. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge

According to Figure 1, it can be interpreted that teacher educators had rich pedagogical content knowledge. However, they had insufficient knowledge of technology such as understanding

of using computer software and hardware, presentation tools, and other technologies used in educational contexts.

Findings on the Technological Pedagogical and Content Knowledge of Teacher Educators in terms of Designation

To find out the significant difference in the technological pedagogical and content knowledge of teacher educators in terms of designation, teacher educators were divided into five groups such as Tutor, Assistant Lecturer, Lecturer, Associate Professor, and Professor.

According to Table 2, the means of lecturer were the highest in the dimensions of technological knowledge (19.33), pedagogical knowledge (21.00), technological content knowledge (20.67), pedagogical content knowledge (20.89), technological pedagogical knowledge (19.78), and the professor possessed the highest means in content knowledge (20.29) and technological pedagogical content knowledge (19.18). On the other hand, the assistant lecturer had the lowest means in all dimensions among their designations.

Table 2 Comparison of Means and Standard Deviations on each Dimension in terms of Designation

Designation	***N***	***M/SD***	**Dimension**						
			D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
Tutor	38	*M*	17.39	19.58	19.39	18.66	19.89	18.63	19.16
		SD	3.018	1.940	1.794	1.805	1.842	2.267	1.685
Assistant Lecturer	35	*M*	15.74	19.29	18.40	17.97	19.34	18.03	18.09
		SD	2.984	1.792	2.488	1.774	1.552	2.491	2.254
Lecturer	9	*M*	19.33	21.00	20.22	20.67	20.89	19.78	19.00
		SD	2.958	1.500	1.481	1.323	1.616	4.024	3.708
Associate Professor	40	*M*	17.98	19.93	19.48	18.83	20.00	18.95	19.03
		SD	2.465	1.474	1.853	1.960	1.177	2.470	1.833
Professor	38	*M*	16.18	20.32	20.29	18.37	20.84	19.45	19.18
		SD	4.373	2.207	2.265	3.830	2.163	3.562	3.455

Note. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge

To determine the significant difference in the technological pedagogical and content knowledge of teacher educators in terms of designation, the collected data were analyzed by using (ANOVA).

Table 3 ANOVA Results of Technological Pedagogical and Content Knowledge of Teacher Educators in terms of Designation

Dimension	Designation	Sum of Squares	*df*	Mean Square	*F*	Sig. (2-tailed)
D1	Between Groups	173.550	4	43.387	4.065	.004**
	Within Groups	1654.450	155	10.674		
	Total	1828.000	159			
D2	Between Groups	34.302	4	8.576	2.501	.045*
	Within Groups	531.392	155	3.428		
	Total	565.694	159			
D3	Between Groups	70.868	4	17.717	4.094	.004**
	Within Groups	670.825	155	4.328		
	Total	741.694	159			
D4	Between Groups	56.453	4	14.113	2.342	.057 (ns)
	Within Groups	934.141	155	6.027		
	Total	990.594	159			
D5	Between Groups	48.538	4	12.134	4.130	.003**
	Within Groups	455.406	155	2.938		
	Total	503.944	159			
D6	Between Groups	46.368	4	11.592	1.451	.220 (ns)
	Within Groups	1238.032	155	7.987		
	Total	1284.400	159			
D7	Between Groups	29.494	4	7.373	1.190	.317 (ns)
	Within Groups	960.481	155	6.197		
	Total	989.975	159			

Note. D1 = Technological Knowledge D5 = Pedagogical Content Knowledge
D2 = Pedagogical Knowledge D6 = Technological Pedagogical Knowledge
D3 = Content Knowledge D7 = Technological Pedagogical Content Knowledge
D4 = Technological Content Knowledge, ns = not significant, * $p<.05$ ** $p<.01$

Based on the results, there were significantly different in technological knowledge, pedagogical knowledge, content knowledge, and pedagogical content knowledge among their designations. In order to examine which groups had significant differences in technological knowledge, pedagogical knowledge, content knowledge, and pedagogical content knowledge among their designations, Post Hoc Multiple Comparison Test (Tukey HSD) was used (see Table 3).

Table 4 Multiple Comparisons for Pedagogical Knowledge, Content Knowledge and Pedagogical Content knowledge

Dependent Variable	Designation (I)	Designation (J)	MD (I-J)	Sig. (2-tailed)
Technological Knowledge	Lecturer	Assistant Lecturer	3.590	.031*
	Associate Professor	Assistant Lecturer	2.232	.030 *
Content Knowledge	Professor	Assistant Lecturer	1.889	.001 **
Technological Content Knowledge	Lecturer	Assistant Lecturer	2.695	.031 *
Pedagogical Content Knowledge	Professor	Assistant Lecturer	1.499	.002 **

Note. * $p<.05$, ** $p<.01$

According to Table 4, there were significant differences between Lecturer and Assistant Lecturer at (p < 05), Associate Professor and Assistant Lecturer at (p < 05) in technological knowledge. For the dimension of content knowledge, there was a significant difference between Professor and Assistant Lecturer at (p <.01). In the technological content knowledge, there was a significant difference between Lecturer and Assistant Lecturer at (p < 0.5), and there was a significant difference between Professor and Assistant Lecturer at (p <.01). Therefore, it can be interpreted that the teachers' knowledge can develop over time, and through experience.

Findings on the Technological Pedagogical and Content Knowledge of Teacher Educators in terms of Teaching Experience

To examine the technological pedagogical and content knowledge of teacher educators in terms of teaching experience, the teaching experience of participants was divided into three groups: 0-10 years, 11-20 years, and over 20 years.

Table 5 ***Comparison of Means and Standard Deviations on each Dimension in terms of Teaching Experience***

Teaching Experience	***N***	***M/SD***	**Dimension**						
			D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
0-10 Years	42	*M*	17.14	19.45	19.40	18.50	19.86	18.64	19.05
		SD	3.104	1.797	1.654	1.798	1.761	2.272	1.724
11-20 Years	61	*M*	17.41	19.95	19.15	19.02	20.07	19.05	18.82
		SD	3.227	1.802	2.235	1.928	1.237	2.629	2.453
Over 20 Years	57	*M*	16.46	20.05	19.82	18.21	20.26	18.79	18.84
		SD	3.732	2.022	2.376	3.315	2.240	3.416	3.005

Note. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge

According to Table 5, teacher educators who had (over 20 years) of teaching experience possessed the highest means in pedagogical knowledge (20.05), content knowledge (19.82), and pedagogical content knowledge (20.26). On the other hand, the teachers with (0-10 years) and (11-20 years) teaching experience possessed a higher mean of technological knowledge than the teacher with (over 20 years) teaching experience.

Therefore, it can be interpreted that teacher educators' pedagogical knowledge, content knowledge, and pedagogical content knowledge gradually increased according to the increment of the year of their teaching experience but they are not knowledgeable about technology like young teacher educators.

To determine the significant difference in the technological pedagogical and content knowledge of teacher educators in terms of teaching experience, the collected data were analyzed by using the one-way analysis of variance (ANOVA).

Table 6 ANOVA Results of Technological Pedagogical and Content Knowledge of Teacher Educators in terms of Teaching Experience

Teaching Dimension	Experience	Sum of Squares	*df*	Mean Square	*F*	Sig. (2-tailed)
D1	Between Groups	27.963	2	13.981	1.219	.298 (ns)
	Within Groups	1800.037	157	11.465		
	Total	1828.000	159			
D2	Between Groups	9.594	2	4.797	1.354	.261 (ns)
	Within Groups	556.099	157	3.542		
	Total	565.694	159			
D3	Between Groups	13.657	2	6.828	1.473	.232 (ns)
	Within Groups	728.037	157	4.637		
	Total	741.694	159			
D4	Between Groups	19.636	2	9.818	1.588	.208 (ns)
	Within Groups	970.957	157	6.184		
	Total	990.594	159			
D5	Between Groups	4.011	2	2.005	.630	.534 (ns)
	Within Groups	499.933	157	3.184		
	Total	503.944	159			
D6	Between Groups	4.431	2	2.215	.272	.762 (ns)
	Within Groups	1279.969	157	8.153		
	Total	1284.400	159			
D7	Between Groups	1.475	2	.737	.117	.890 (ns)
	Within Groups	988.500	157	6.296		
	Total	989.975	159			

Note. *Note*. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge,
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge
ns = not significant

According to the results, teacher educators' technological pedagogical and content knowledge was not significantly different. Therefore, teacher educators had no different technological pedagogical content knowledge according to their teaching experiences (see Table 6).

Descriptive Statistics of Teacher Educators' Self-Efficacy on each Dimension

Table 7 Mean and Standard Deviation of Teacher Educators' Self-Efficacy

Dimension	*N*	*M*	*SD*
D1	160	15.23	1.799
D2	160	14.79	1.836
D3	160	15.13	1.783
D4	160	15.21	2.249
D5	160	15.09	2.431
D6	160	15.06	2.343

Note. D1 = Self-Efficacy in Instruction,
D2= Self-Efficacy in Adapting Individual Needs
D3 = Self-Efficacy in Motivating Students
D4 = Self-Efficacy in Maintaining Discipline
D5 = Self-Efficacy in Cooperating with Parents and Colleagues
D6 = Self-Efficacy in Coping with the changes

According to Table 7, the mean score of teacher educators' self–efficacy was the highest in instruction (15.23) and the mean score of self–efficacy in adapting to individual needs was the lowest (14.79). The comparison of the means for each dimension was presented in Figure 2.

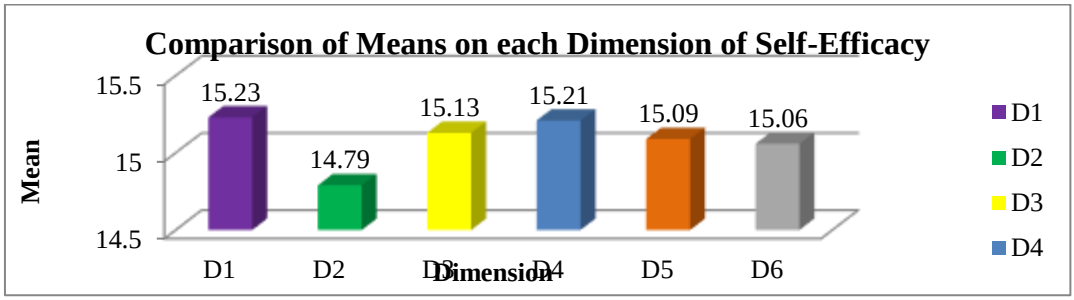

Figure 2 Comparison of Means on each Dimension of Self-Efficacy

Note. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge

According to Figure 2, teacher educators had the highest self-efficacy in instruction but they have the lowest self-efficacy in adapting to individual needs.

Findings on Self-Efficacy of Teacher Educators in terms of Designation

To examine the self-efficacy of teacher educators in terms of designation, the obtained data was analyzed by using descriptive statistics, one-way analysis of variance (ANOVA), and Post Hoc test.

Table 8 Mean and Standard Deviation of Teacher Educators' Self-Efficacy in terms of Designation

Designation	***N***	***M/SD***	**Dimension**					
			D1	**D2**	**D3**	**D4**	**D5**	**D6**
Tutor	38	*M*	15.24	14.76	15.24	15.42	15.21	15.26
		SD	1.460	1.403	.998	1.588	1.318	1.349
Assistant Lecturer	35	M	14.60	13.91	14.40	14.46	14.09	14.00
		SD	2.018	2.280	2.199	3.248	1.318	3.325
Lecturer	9	M	15.22	15.22	15.67	16.00	16.67	15.44
		SD	1.986	2.438	2.121	1.936	1.936	2.242
Associate Professor	40	M	15.30	15.25	15.40	15.40	15.30	15.15
		SD	1.400	1.056	1.355	1.722	1.786	1.369
Professor	38	M	15.74	15.05	15.26	15.29	15.32	15.63
		SD	2.114	2.053	2.152	2.192	2.692	2.655

Note. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge

According to Table 8, the professors had the highest means of self-efficacy in instruction (15.74) and coping with the change (15.63). The associate professors possessed the highest mean of adapting individual needs (15.25) and the means of the lecturers were the highest in motivating students (15.67), maintaining discipline (16.00) and cooperating with parents and colleagues (16.67) respectively. However, assistant lecturers had the lowest means of all dimensions.

To determine the significant difference in teacher educators' self-efficacy in terms of designation, the collected data were analyzed by using the one-way analysis of variance (ANOVA).

According to ANOVA results, dimensions of adapting to individual needs, cooperating with parents and colleagues, and coping with the changes were significantly different (see Table 9).

Table 9 ANOVA Results of Teacher Educators' Self-Efficacy in terms of Designation

Dimension	Designation	Sum of Squares	*df*	Mean Square	*F*	Sig. (2-tailed)
D1	Between Groups	23.851	4	5.963	1.884	.116 (ns)
	Within Groups	490.592	155	3.165		
	Total	514.444	159			
D2	Between Groups	39.632	4	9.908	3.093	.018*
	Within Groups	496.562	155	3.204		
	Total	536.194	159			
D3	Between Groups	25.263	4	6.316	2.038	.092 (ns)
	Within Groups	480.237	155	3.098		
	Total	505.500	159			
D4	Between Groups	28.829	4	7.207	1.441	.223 (ns)
	Within Groups	775.365	155	5.002		
	Total	804.194	159			
D5	Between Groups	61.925	4	15.481	2.734	.031*
	Within Groups	877.669	155	5.662		
	Total	939.594	159			
D6	Between Groups	54.961	4	13.740	2.605	.038*
	Within Groups	817.533	155	5.274		
	Total	872.494	159			

Note. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge,
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge
*$p < .05$, ns = not significant

Post Hoc Multiple Comparison Test (Tukey HSD) was used to examine which groups had significant differences in dimensions of adapting to individual needs, cooperating with parents and colleagues, and coping with the changes.

Table 10 Multiple Comparisons for Self-Efficacy in Adapting Individual Needs, Cooperating with Parents and Colleagues and Coping with the Changes

Dependent Variable	Designation (I)	Designation (J)	MD (I-J)	Sig. (2-tailed)
Adapting Individual Needs	Associate Professor	Assistant Lecturer	1.336	.013*
Cooperating with Parents and Colleagues	Lecturer	Assistant Lecturer	2.581	.034*
Coping with the Challenges	Professor	Assistant Lecturer	1.623	.023*

Note. *p<.05

Table 10 indicated that there were significant differences between Associate Professor and Assistant Lecturer at (p < .05) in adapting individual needs, Lecturer and Assistant Lecturer at (p < .05) in cooperating with parents and colleagues, Professor and Assistant Lecturer at (p < .05) in coping with the changes.

Findings on Teacher Educators' Self-Efficacy in terms of Teaching Experience

According to Table 11, teacher educators who had (over 20 years) of teaching experience possessed the lowest means of instruction (15.14), motivating students (15.05), maintaining discipline (14.77), cooperating with parents and colleagues (14.70), and coping with the changes (14.93) among their teaching experience. This findings said that the experienced teacher educators had lower self-efficacy than the young teacher educators.

Table 11 Descriptive Statistics of Teacher Educators' Self-Efficacy in Terms of Teaching Experiences

Teaching Experience	N	*M/SD*	D1	D2	D3	D4	D5	D6
0-10 Years	42	*M*	15.33	14.67	15.10	15.48	15.26	15.21
		SD	1.572	1.426	1.122	1.565	1.438	1.457
11-20 Years	61	*M*	15.25	14.77	15.21	15.43	15.34	15.07
		SD	1.598	1.856	1.473	1.511	1.788	1.861
Over 20 Years	57	*M*	15.14	14.91	15.05	14.77	14.70	14.93
		SD	2.150	2.090	2.401	3.134	3.391	3.206

Note. D1 = Technological Knowledge
D2 = Pedagogical Knowledge
D3 = Content Knowledge
D4 = Technological Content Knowledge
D5 = Pedagogical Content Knowledge
D6 = Technological Pedagogical Knowledge
D7 = Technological Pedagogical Content Knowledge

To examine the difference between teacher educators' self-efficacy in terms of teaching experience, one-way analysis of variance (ANOVA) was used.

Table 12 ANOVA Results of Teacher Educators' Self-Efficacy in terms of Teaching Experience

Dimension	Teaching Experience	Sum of Squares	*df*	Mean Square	*F*	Sig. (2-tailed)
1	Between Groups	.922	2	.461	.141	.869 (ns)
	Within Groups	513.522	157	3.271		
	Total	514.444	159			
D2	Between Groups	1.512	2	.756	.222	.801 (ns)
	Within Groups	534.682	157	3.406		
	Total	536.194	159			
D3	Between Groups	.809	2	.405	.126	.882 (ns)
	Within Groups	504.691	157	3.215		
	Total	505.500	159			
D4	Between Groups	16.764	2	8.382	1.67	.191 (ns)
	Within Groups	787.429	157	5.015		
	Total	804.194	159			
D5	Between Groups	13.774	2	6.887	1.17	.314 (ns)
	Within Groups	925.819	157	5.897		
	Total	939.594	159			
D6	Between Groups	1.965	2	.983	.177	.838 (ns)
	Within Groups	870.528	157	5.545		
	Total	872.494	159			

Note. D1 = Technological Knowledge D5 = Pedagogical Content Knowledge
D2 = Pedagogical Knowledge D6 = Technological Pedagogical Knowledge
D3 = Content Knowledge D7 = Technological Pedagogical Content Knowledge
D4 = Technological Content Knowledge, ns = not significant

According to ANOVA results, the self-efficacy of teacher educators was not significantly different in terms of teaching experience. The number of years teachers spent on their work can increase their self-efficacy because they gained experience when teaching. But the means of teachers' who had over twenty years of teaching experience were the lowest in the dimensions of self-efficacy in instruction, motivating students, maintaining discipline, cooperating with parents and colleagues, and coping with the changes. Therefore, it can be interpreted that the different years of teaching experience could not make any difference in their self-efficacy (see Table 12).

Findings on the Relationship between Teacher educators' Technological Pedagogical Content Knowledge and Self-Efficacy

To find out the relationship between teacher educators' technological pedagogical content knowledge and self-efficacy the Person-product movement correlation was utilized. The results of the Pearson-product movement correlation between teacher educators' technological pedagogical content knowledge and self-efficacy were presented in Table 13.

Table 13 Person-product Movement Correlation between Teacher educators' Technological Pedagogical Content Knowledge and Self-Efficacy

		TPACK	Self-Efficacy
Technological Pedagogical Content Knowledge (TPACK)	Pearson Correlation	1	.677***
	Sig. (2-tailed)		.000
	N	160	160
Self-Efficacy	Pearson Correlation	.677***	1
	Sig. (2-tailed)	.000	
	N	160	160

Note. ***Correlation is significant at the .001 level (2-tailed).

According to Table 13, there was a significant correlation between teacher educators' technological pedagogical content knowledge and self-efficacy (r = .677, $p < .001$). Therefore, it can be interpreted that there was a strong positive relationship between teacher educators' technological pedagogical content knowledge and their self-efficacy. To sum up, the better technological pedagogical content knowledge the teachers have, the higher self-efficacy they will possess.

Discussion and Suggestions

Discussion

The purpose of this research is to investigate teacher educators' technological pedagogical content knowledge on their self-efficacy. Based on the results of the findings, teacher educators had rich pedagogical content knowledge. On the contrary, they had insufficient technological knowledge and the ability to use technologies in their educational contexts.

In finding the differences between teacher educators' technological pedagogical content knowledge in terms of designation, there were differences between Assistant Lecturer and other designations of Professor, Associate Professor, and Lecturer. Based on the findings, Assistant Lecturer had the lowest level of technological knowledge, content knowledge, technological content knowledge, and pedagogical content knowledge among different designations. In the study of Thinzarkyaw (2020), there was a significant difference in technological and content knowledge by their rank. Therefore, this study was consistent with the study of Thinzarkyaw (2020).

The study of Bingimlas (2018) showed that teachers' Technological Knowledge was significantly different among teachers, with various levels of teaching experiences and the findings of Kazul and Erten (2014) also stated that there was a significant difference between teachers in the sub-dimension of TK. In this study, there was no significant difference between teacher educators who had 0-10 years, 11-20 years, and over 20 years of teaching experience. Therefore, this finding was not consistent with the study of Bingimlas (2018) and Kazul and Erten (2014).

In examining the extent of teacher educators' self-efficacy in instruction, the findings of this study revealed that teacher educators highly possessed instructional self-efficacy among six dimensions and they had insufficient self–efficacy in adapting to individual needs.

In the finding of the differences in teacher educators' self–efficacy in terms of designation, it was found that the Professor had higher self-efficacy in adapting to individual needs and coping with the changes, the Lecturer also had higher self-efficacy in cooperating with parents and colleagues than the self-efficacy of the Assistant Lecturer. Therefore, the Assistant Lecturer had the lowest self-efficacy in all dimensions.

In the finding of the differences in teacher educators' self-efficacy in terms of teaching experiences, there was no significant difference between teacher educators. The study of Malik (2011) stated that the number of years teachers spent on their work can increase their self-efficacy because they gained experience when teaching. However, the means of teachers' who had over twenty years of teaching experience were the lowest in the dimensions of self-efficacy in instruction, motivating students, maintaining discipline, cooperating with parents and colleagues, and coping with the changes in this study. Therefore, this finding was inconsistent with the study of Malik.

In exploring the relationship between teacher educators' technological pedagogical content knowledge and their self-efficacy, the finding confirmed that there was a significant positive relationship between teacher educators' technological pedagogical content knowledge and their self-efficacy. Bahriah and Yunita (2019) also stated that there is a relationship between the technological pedagogical content knowledge (TPACK) of sixty-one teachers with the self-efficacy. Therefore, this finding had supported by the study of Bahriah and Yunita (2019). The results of this study revealed that the better technological pedagogical content knowledge the teachers have, the higher self-efficacy they will possess.

Suggestions

According to the findings, the research suggestions and recommendations for further researchers were given.

In this study, the majority of teacher educators did not have enough technological knowledge. There were significant differences between teacher educators' technological pedagogical and content knowledge in terms of designation. Therefore, principals should encourage teachers to use technology in their teaching and learning. Besides, principals should support teachers with different technological tools and resources, workshops, and professional development programs related to pedagogical content knowledge.

This study pointed out that the majority of experienced teacher educators had lower self-efficacy. Teachers' self-efficacy beliefs are intertwined with psychological states such as anxiety, stress, and fatigue. Therefore, the principal should provide a safe and supportive environment in which teachers may learn and teach non-threatening, interact and establish rapport with each other.

There was a strong positive relationship between teacher educators' technological pedagogical content knowledge and self-efficacy. Therefore, teacher educators should have the TPACK competencies which can influence the quality of teaching of the teachers, can improve the education performance, and create a positive vibe to upgrade the teachers' confidence and increase self-efficacy in teaching.

The present study was delimited in terms of area of study, type of Education Degree College. Hence the following recommendations are made for future research:

1. Although this study focused on five Education Degree Colleges in Myanmar, further research should be carried out on other Education Degree Colleges and Academic Universities, and Basic Education Schools as well.
2. It was a small-scale study and did not cover all teacher educators from all Education Degree Colleges. Large sample size should be used so that many different results or reasons could produce.
3. Furthermore, as this research was a quantitative study, a qualitative study related to teachers' TPACK should be carried out to have a deeper understanding of that issue.

Conclusion

Technological pedagogical content knowledge is an essential part of the teacher education system today. In teacher education, it supports teacher educators to be completely up-to-date and knowledgeable and to effectively incorporate it into their lessons. Therefore, teacher educators can assist student teachers to have a better understanding of the content and educational practices and it can also encourage teacher candidates to apply this knowledge in their teaching profession later.

In in-service teacher education, technological pedagogical content knowledge is the heart of good teaching. As instructional technologies have evolved, the pedagogical paradigm has changed from teacher-centered to student-centered, and integrating up-to-date technologies into instruction evokes meaningful learning.

Therefore, teacher educators and principals should emphasize not getting adequate technological pedagogical content knowledge but utilizing innovative technologies and tools by linking with pedagogical content knowledge in an effective way that can support the development of teachers' self-efficacy.

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