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Original Article

An Investigation into the Level of High School Teachers' Technological Pedagogical Content Knowledge in Myanmar

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High School Teachers, Content Knowledge, Pedagogical Knowledge, Pedagogical Content Knowledge, Technological Knowledge, Technological Pedagogical Knowledge, Pedagogical Content Knowledge, Basic Education High Schools.

ABSTRACT

The purpose of this study was to investigate the Level of High School Teachers' Technological Pedagogical Content Knowledge (TPCK) in Myanmar. A sample of 300 teachers was selected from a population of 1439 senior assistant teachers from Basic Education High Schools in three divisions, Mandalay Region, Myanmar. For data collection, a quantitative survey research design was employed, utilizing the TPACK questionnaire developed by Schmidt (2009). The results showed that high school teachers' Content Knowledge (CK) was the highest with a mean of 3.82, while their Technological Pedagogical Content Knowledge (TPCK) was the lowest with a mean of 2.79. The study concludes that while teachers have strong content and pedagogical knowledge, their technological pedagogical skills remain underdeveloped. This suggests the need for targeted professional development programs focusing on TPCK enhancement. The findings highlight the critical role of technological knowledge in improving teaching quality and adapting to modern educational demands. Given the increasing integration of technology in education, Myanmar's teachers must be equipped with digital literacy skills and effective strategies to incorporate technology into their pedagogical practices. Furthermore, the study recommends that structured training programs and workshops on TPCK be implemented to enhance teachers' competencies in this area. This will not only improve their ability to use technology effectively in the classroom but also contribute to the successful implementation of curriculum reforms aimed at fostering 21st-century skills among students. Future research should explore the impact of TPCK-focused training programs on teachers' instructional effectiveness and student learning outcomes.

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INTRODUCTION

Teachers play an important role in achieving the best outcomes of the learning process and students' learning success is influenced (Saribas et al., 2013). Then, teachers' knowledge and skills in their teaching process have an impact on their students' learning and achieving their lesson goals (Widodo & Wahyudin, 2018). In the previous centuries, most of the teachers and community believed that a teacher who had a strong background knowledge of the subject matter could teach the new content. Drummond and Sweeney (2017) state that nowadays, integrating technology into the classroom has become a considerable component around the world. In this century, the teaching process is more than giving a lecture to students and the learning process is more than memorizing or absorbing information. Besides, these days, most of the students are capable of adapting to the latest technology themselves and choosing and evaluating their desirable learning process. If a teacher owns the right knowledge and gives a lecture to fulfil students' needs, the teaching and learning process is valuable. Modern teaching extends beyond lecturing, requiring teachers to incorporate diverse teaching strategies and adapt to students' technological proficiency.

Importance of the Study

We all know that Myanmar is a developing country and leading towards a democratic society. Every developed country understands the importance of education and invests a lot in it. Thus, to be a developed country, the most fundamental thing to do in every country is to upgrade the standard of education. In our country, according to the National Education Strategic Plan (2016-2021), the education system is shifting towards a student-centred approach and curriculum frameworks have been reformed since 2016. In implementing the new education system, many challenges regarding students and teachers appear clearly. In the teaching process of new syllabuses, many teachers at Basic Education encounter challenges. Due to the lack of modern teaching methods, they cannot teach the new syllabus effectively. It is a great problem in our society. To implement the new education system well, teachers who are qualified, creative, energetic for learning something new, enthusiastic in the teaching and learning process, and passionate about teaching, are urgently needed. Besides, the teachers in the 21st century, especially the teachers at Basic Education, need to be proficient in digital literacy.

Goradia (2018) states that to meet the demand of the 21st century skills in this era plus the prevalence of technology in all fields, global trends in teaching processes are shifting towards applying digital pedagogies. During the COVID-19 pandemic, it can be clearly seen that knowledge related to the technology of education plays an important role in all aspects of teachers' knowledge. The current curriculum reforms at the high school level in Myanmar are focused on higher-order thinking skills especially problem-solving skills, inquiring skills, reasoning skills, communicating skills, conceptualizing skills and creative and innovative skills.

Thus, basic education plays an important role in preparing students for their adult life. It means that the teachers in the basic education sector have the responsibility to equip students with the skills necessary to enter a society where technology-related competencies are becoming increasingly indispensable. For achieving these skills, teachers' technological pedagogical content knowledge is

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very important to deliver the content in the curriculum reforms effectively. Thus, it can be said that technology has become a crucial role in the Basic Education Sectors. Koehler and Mishra (2009) point out that a plus in pedagogical content and technological knowledge has to be a focal point for the effective teaching and learning process of teachers. For this reason, an investigation into the level of Myanmar high school teachers' technological pedagogical knowledge (TPCK) is necessary not only for improving the quality of basic education but also for raising the professional development of high school teachers.

REVIEW OF RELATED LITERATURE

CONTENT KNOWLEDGE (CK)

Shulman (1987) stated that the teachers' knowledge about the subject matter they are teaching is content knowledge. Cogill (2008) pointed out that knowledge of the content of the subject matter is essential not only for teaching itself but also for the evaluation of textbooks, learning materials and technology-based teaching aids. Shulman (1987) suggests that content knowledge is a significant aspect of teaching since it has an impact on planning, task setting, questioning, explaining, giving feedback and assessment.

Pedagogical Knowledge (PK)

A person who is going to deliver the subject matter to students must have a wide knowledge of that subject matter as a prerequisite to teaching. In spite of the importance of knowledge of the theories and methods of teaching, the role of pedagogical knowledge is more important than that of the qualifications of a teacher (Shulman, 1986). In the role of developing the pedagogy, teachers have to work professionally to better understand, create and respond to the appropriate conditions via enhanced educational practice and their growth of professional knowledge.

Pedagogical Content Knowledge (PCK)

Shulman (1986) claimed that pedagogical content knowledge is a distinct body of knowledge even though knowledge of content and knowledge of pedagogy contribute to it. He also noted that pedagogical content knowledge includes knowledge of learners, knowledge of educational context, and knowledge of instructional materials (Kilic, 2009). Pedagogical content knowledge also includes an understanding of what makes the learning of specific topics easy or difficult (Shulman, 1986).

Technological Knowledge (TK)

Koehler & Misher (2006) claimed that advanced technology linked with the internet and digital videos for teachers' technological knowledge beyond knowledge about teaching aids using standard pen and paper, including books and whiteboards. In this 21st century, computer hardware, word processors, spreadsheets, browsers and email are some examples of digital technologies. Besides, technological knowledge indicates installing and removing devices and software programs and creating and archiving documents Koehler & Misher (2006).

Technological Content Knowledge (TCK)

Technological content knowledge is described as the total intersection between technology and content highlighted in a theoretical framework (Slough & Connell, 2006). Due to the popularity of technology in education, Mishra and Koehler (2006) extended Shulman's (1986) pedagogical content knowledge (PCK) by adding technological knowledge (TK) as an integrated part of pedagogical knowledge (PK) and content knowledge (CK). Successful integration of technology into the classroom requires one to focus on the complex interplay of these three forms of knowledge (Mishra & Koehler, 2006).

Technological Pedagogical Knowledge (TPK)

Technological Pedagogical Knowledge (TPK) refers to the competence of numerous technologies being used in teaching and learning (Koehler & Mishra, 2006). Then, Kleickmann, T., Kunter, M., Richter, D., & Elsner, J. (2012) state that technological pedagogical knowledge (TPK) is knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies in a particular way.

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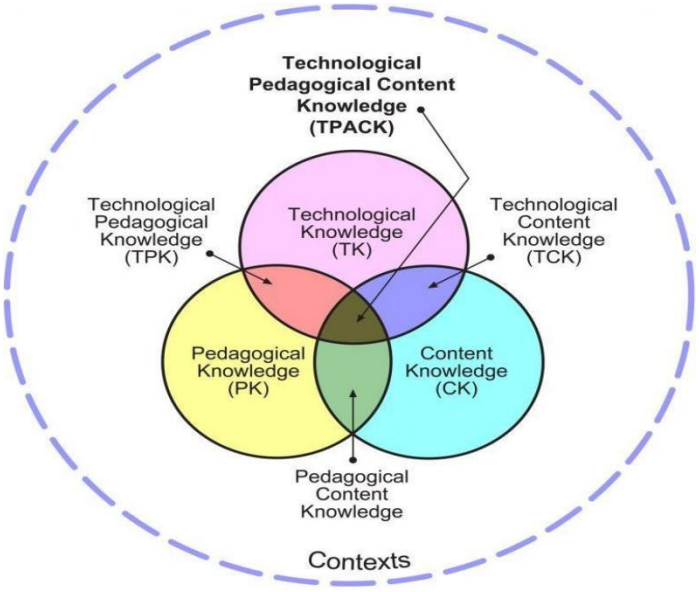
Conceptual Framework of Technological Pedagogical Content Knowledge (TPCK)

Technological pedagogical content knowledge (TPCK) is an emergent form of knowledge that goes beyond all three components (content, pedagogy, and technology). It can be clearly seen that TPCK is not the same as knowledge of a discipline and the pedagogical knowledge delivered by teachers across disciplines. TPCK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones. Technological Pedagogical Content Knowledge (TPACK) refers to the knowledge to integrate technology into the pedagogical approaches in teaching in a subject area (Schmidt et al., 2009). Koehler and Mishra (2009) describe that the addition of a new technology is not the same as adding another module to a course.

Figure 1. The TPACK Framework and its Knowledge Components (Koehler & Mishra, 2009)



Research Questions

- What is the level of Technological Pedagogical Content Knowledge (TPCK) among high school teachers in Myanmar?
- What are the strengths and weaknesses in the different knowledge domains of the TPACK framework among high school teachers in Myanmar?
- Is there a need for professional development programs to enhance TPCK among high school teachers in Myanmar?

METHODOLOGY

Research Design

For data collection, a quantitative method was used in this study. The questionnaire survey method, one of the descriptive designs was employed to identify the level of Technological and Pedagogical Content Knowledge (TPACK) among high school teachers in Myanmar.

Instrument

In this study, the TPACK questionnaire developed by Schmidt (2009) was used. According to the purpose of this study, 30 items from this instrument were chosen and modified. The participants responded on the basis of a five-point Likert scale, ranging from 5 (strongly agree) to 1 (strongly

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disagree). To get questionnaire validation, this questionnaire was given to three experts under the Department of Basic Education. According to their advice, suggestions and support, this questionnaire was modified again.

Population and Sample

Participants in this study were all school teachers who are working at Basic Education High Schools in three divisions namely Maharaung Myay Division, Aung Myay Tharzan Division and Pyin Oo Lwin Division, Myanmar. There are three profiles of teachers in high schools. They are primary assistant teacher, junior assistant teacher and senior assistant teacher. The senior assistant teachers were selected for this study using a stratified sampling method. A sample of 300 teachers was selected from a population of 1439 senior assistant teachers from these three divisions. The total number of participants in this study was 300 teachers.

Data Collection and Presentation

The data for this study were collected from a sample of high school teachers selected from three divisions in the Mandalay Region: Maharaung Myay, Aung Myay Tharzan, and Pyin Oo Lwin. The first step in the data collection process involved administering a background questionnaire to gather demographic and professional information about the participants. Afterwards, all participants were provided with uniform instructions on how to complete the questionnaires. The instructions emphasized key points to ensure clarity and cooperation, including: (1) the study is not a test, so there are no correct or incorrect answers; (2) participation is voluntary and the study is not associated with the participants' instructor or college, ensuring there would be no impact on their professional standing; (3) participants are not required to provide personal identification, ensuring anonymity; and (4) the data obtained from the responses would be treated with the utmost confidentiality to respect their privacy. Once the instructions were clarified, the questionnaires were administered. A total of 300 high school teachers participated in the study, with respondents representing the three divisions of Maharaung Myay, Aung Myay Tharzan, and Pyin Oo Lwin. To ensure a representative sample, a stratified sampling method was employed, which involved dividing the population into distinct strata based on relevant characteristics (such as teaching experience, school type, and subject specialization) and then selecting participants proportionally from each group. This approach helped capture a broad range of perspectives across different teaching contexts. The data collected through the questionnaires were analyzed using descriptive statistics, specifically focusing on measures of central tendency such as means and measures of variability, including standard deviations. These statistical techniques were used to summarize the responses and provide insights into the teachers' competencies and perceptions related to the study's focus.

RESEARCH FINDINGS

This section gives a clear description of the findings based on the analyses of high school teachers' responses to the TPACK Questionnaire.

Content Knowledge (CK)

Table 1: Descriptive Statistics of Content Knowledge (CK)

	Content Knowledge	Sum	M	SD
1.	I know the latest developments pertaining to the subject	1213	3.79	.932
2.	I know the basic theory of teaching materials.	1248	3.90	.858
3.	I know about the development of important theories.	1149	3.59	.962
4.	I have sufficient knowledge about my subject.	1280	4.00	.871

Table 1 shows the descriptive statistics of content knowledge gained by participants. Content Knowledge (CK) occupies four items and the highest level of content knowledge of participants is item number 4 "I have sufficient knowledge about my subject".

Pedagogical Knowledge (PK)

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Table 2: Descriptive Statistics of Pedagogical Knowledge (PK)

	Pedagogical Knowledge	Sum	M	SD
1.	I know how to assess students' performance.	1181	3.69	.983
2.	I can adapt/modify teaching based on the students' understanding.	1197	3.74	.953
3.	I can adapt/modify my teaching style to cater to different groups of students.	1137	3.55	.981
4.	I can diversify my teaching approaches in the classroom.	1225	3.83	.888
5.	I know how to manage the classroom.	1233	3.85	.827

Table 2 shows the descriptive statistics of pedagogical knowledge gained by participants. Pedagogical Knowledge (PK) occupies five items and the highest level of pedagogical knowledge of participants is item number 5 "I know how to manage the classroom".

Pedagogical Content Knowledge (PCK)

Table 3: Descriptive Statics of Pedagogical Content Knowledge (PCK)

	Pedagogical Content Knowledge (PCK)	Sum	M	SD
1.	I know how to select effective teaching approaches to guide the student in the subject	1134	3.54	1.004
2.	I know about different teaching approaches that are relevant to facilitate the subject that I teach	1188	3.71	.969
3.	I can adapt the latest teaching method to match the learning outcomes that need to be achieved.	1115	3.48	.979
4.	I can choose a suitable assessment method for the relevant subject to measure students' achievement in fulfilling the learning outcomes.	1161	3.63	.883
5.	Through teaching materials, I know how to guide students in planning their learning.	1214	3.79	.910
6.	I know how to guide students to think creatively by using teaching materials	1122	3.51	.986

Table 3 shows the descriptive statistics of pedagogical content knowledge gained by participants. Pedagogical Content Knowledge occupies six items and the highest level of pedagogical content knowledge of participants is item number 5 "Through teaching materials, I know how to guide students in planning their learning".

Technological Knowledge (TK)

Table 4: Descriptive Statics of Technological Knowledge (TK)

	Technological Knowledge (TK)	Sum	M	SD
1.	I keep myself updated with new technologies.	1083	3.38	.966
2.	I know different types of technology.	1070	3.34	1.005
3.	I know the technical skills to use technology.	1024	3.20	1.046

Table 4 shows the descriptive statistics of technological knowledge gained by participants. Technological Knowledge occupies three items and the highest level of technological knowledge of participants is item number 1 "I keep myself updated with new technologies".

Technological Content Knowledge (TCK)

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Table 5: Descriptive Statistics of Technological Content Knowledge (TCK)

	Technological Content Knowledge (TCK)	Sum	M	SD
1.	I know about the technology that can be used to increase students' understanding of the subject that I teach.	1205	3.77	.884
2.	I know about the technology that can be used to explain the difficult topics in the subject that I teach.	1139	3.56	.908
3.	I know about the Information Communication Technology (ICT) application that can be used to increase my understanding of the teaching content.	1116	3.49	.878

Table 5 shows the descriptive statistics of technological content knowledge gained by participants. Technological Content Knowledge occupies three items and the highest level of technological content knowledge of participants is item number 1 "I know about the technology that can be used to increase student's understanding of the subject that I teach".

Technological Pedagogical Knowledge (TPK)

Table 6: Descriptive Statistics of Technological Pedagogical Knowledge (TPK)

	Technological Pedagogical Knowledge (TPK)	Sum	M	SD
1.	I know how to use ICT in teaching as a tool for the student to plan their own learning.	1168	3.65	.897
2.	I think critically about how to use technology in the classroom.	1122	3.51	.986
3.	I can adapt/ modify the use of technology to diversify teaching activities.	1108	3.46	.919
4.	I know various latest applications that are effective with the subject I teach.	1079	3.37	.981

Table 6 shows the descriptive statistics of technological content knowledge gained by participants. Technological Content Knowledge occupies four items and the highest level of technological content knowledge of participants is number 1 "I know how to use ICT in teaching as a tool for the student to plan their own learning".

Technological Pedagogical Content Knowledge (TPCK)

Table 7: Descriptive Statistics of Technological Pedagogical Content Knowledge (TPCK)

	Technological Pedagogical Content Knowledge (TPCK)	Sum	M	SD
1.	I know how to apply the use of technology in my teaching approach.	1151	3.60	.873
2.	I know how to choose the technology to be used in class to improve my teaching method.	1041	3.25	.983
3.	I know how to combine content, technology and teaching method in the classroom.	1024	3.20	1.046
4.	I can guide other teachers in coordinating the use of content, technology and teaching methods at school.	1070	3.34	1.005
5.	I can use the technology that gives value to the subject context for the purpose of teaching.	1083	3.38	.966

Table 7 shows the descriptive statistics of technological pedagogical content knowledge gained by participants. Technological Pedagogical Content Knowledge occupies five items and the highest level of technological pedagogical content knowledge of participants is number 1 "I know how to apply the use of technology in my teaching approach".

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Level of Technological Pedagogical Content Knowledge (TPCK)

Table 8: Descriptive Statistics of Level of Technological Pedagogical Content Knowledge (TPCK)

	N	Sum	M	SD
CK	300	4890	3.82	0.905
PK	300	5973	3.73	0.926
PCK	300	7026	3.65	0.942
TK	300	3177	3.30	1.005
TCK	300	3460	3.60	0.890
TPK	300	4477	3.49	0.945
TPCK	300	5369	2.79	0.812

Note: CK = Content Knowledge, PK = Pedagogical Knowledge, TK = Technological Knowledge, PCK = Pedagogical Content Knowledge, TCK = Technological Content Knowledge, TPK = Technological Pedagogical Knowledge, TPCK = Technological Pedagogical Content Knowledge

Table 8 shows that the results of the descriptive statistics conducted to identify the level of Technological Pedagogical Content Knowledge of the teachers indicated that the highest level of all, with a mean of 3.82 was the one related to the Content Knowledge (CK). The Pedagogical Knowledge (PK) occupied the second place with a mean of 3.73. The third place in the increasing order was taken by the Pedagogical Content Knowledge (PCK) with a mean of 3.65. The fourth place was taken by the Technological Content Knowledge (TCK) with a mean of

3.60. The fifth one was taken by the Technological Pedagogical Knowledge (TPK) with a mean of 3.49. The fifth one was taken by the Technological Knowledge (TK) with a mean of 3.30. Finally, the lowest level was the Technological Pedagogical Content Knowledge (TPCK) as its mean was 2.79.

DISCUSSION

The results of the present study reveal that most high school teachers in Myanmar demonstrate strong competency in content knowledge (CK), aligning with findings from prior research indicating that teachers generally excel in their subject matter (Shulman, 1986; Koehler & Mishra, 2008). This high level of content knowledge enables teachers to deliver lessons effectively, as they possess a deep understanding and proficiency in the subject they teach. Moreover, the teachers in this study also exhibit substantial pedagogical knowledge (PK), which is reflected in their ability to manage spontaneous situations, assess student performance accurately, plan lessons effectively, and motivate students. These findings are consistent with previous studies that highlight the importance of PK in enhancing teachers' classroom management and overall teaching effectiveness (Koehler & Mishra, 2009; Abell, 2007).

Furthermore, the teachers in this study demonstrate high levels of Pedagogical Content Knowledge (PCK), as they can integrate effective pedagogical strategies with the content they teach. This aligns with the broader trend observed in similar studies, where teachers who possess strong PCK are able to tailor their teaching methods to their subject matter, leading to better student engagement and learning outcomes (Kleickmann et al., 2012). This competency is likely supported by periodic subject matter modification training programs and workshops facilitated by the Department of Basic Education, which are also noted in previous research as key to improving teachers' content knowledge and pedagogical strategies (Cogill, 2008).

However, the study highlights a gap in technological knowledge (TK), where teachers exhibit limited understanding and proficiency in using digital technologies. While they are familiar with low-tech tools such as pencil and paper, their competence with digital technologies such as the internet, educational software, and digital videos remains weak. This finding echoes the results of other studies that emphasize the need for more exposure to and training in modern technologies to enhance teachers' technological competencies in the classroom

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(Drummond & Sweeney, 2017; Widodo & Wahyudin, 2018).

Additionally, the teachers demonstrate a basic understanding of Technological Content Knowledge (TCK), but they lack proficiency in integrating technology into content-specific lessons. This suggests that while teachers may be aware of the potential for using technology in teaching, they are not fully capable of leveraging it to enhance instructional materials or teaching aids. These findings are consistent with previous research that suggests a lack of proficiency in the integration of technology within the content area is a common challenge for educators, particularly in contexts where professional development in technology integration is limited (Goradia, 2018; Ifenthaler, 2009).

When examining Technological Pedagogical Knowledge (TPK), the study finds that teachers struggle to identify which technologies are best suited to achieving pedagogical goals. This limitation is also supported by previous studies that emphasize the need for systematic training to help teachers understand how to effectively incorporate technology into their teaching practices (Niederhauser & Perkmen, 2008; Schmidt et al., 2009). Without such training, teachers may face difficulties in selecting appropriate technologies that align with both pedagogical strategies and content goals.

Finally, the findings regarding Technological Pedagogical Content Knowledge (TPCK) underscore a significant gap in teachers' ability to integrate technology seamlessly with content and pedagogy in the classroom. The teachers in this study face considerable challenges in selecting and using technology to enhance the teaching and learning process. Previous research similarly highlights the struggle that teachers face when it comes to combining technology with content knowledge and pedagogy, noting that the lack of comprehensive training in TPCK is a key barrier (Mishra & Koehler, 2006; Koehler & Mishra, 2009). The limited availability of TPCK-focused professional development programs and workshops may contribute to this weakness, as teachers are rarely provided with opportunities to strengthen their expertise in this area.

In conclusion, while the high school teachers in Myanmar demonstrate solid knowledge in content, pedagogy, and integration (PCK), their technological competencies, especially in relation to TPCK, remain underdeveloped. The findings suggest a pressing need for more comprehensive and frequent professional development programs that focus on integrating technology into teaching practices, which would help teachers bridge the gap between traditional teaching methods and modern, technology-enhanced approaches (Saribas et al., 2013; Shulman, 1987).

CONCLUSIONS

This study was conducted to investigate the level of Technological Pedagogical Content Knowledge (TPCK) of high school teachers in Basic Education High Schools. The findings reveal that the teachers have a strong background in content knowledge (CK), pedagogical knowledge (PK), and pedagogical content knowledge (PCK) in their teaching process. On the other hand, it is still necessary to raise the rank of having knowledge related to technology. Most of the high school teachers do not have a solid competency of Technological Pedagogical Content Knowledge (TPCK). The cause of the weakness in TPCK is the availability of limited facilities and lack of enough training programs. That's why professional development programs covering subject matter modification and technology and pedagogy training should be provided.

Recommendation

It can be firmly said that in implementing the curriculum reforms, the integration of technology becomes an essential part of the teaching and learning process. The high school level is the central point to link with the higher education that can produce skilled workers. Thus, students need to understand and achieve the targeted goals and objectives of the content in the specified curriculum. In the curriculum reforms, science-based education should be integrated with the help of technology for teaching effectively. Thus, it has no doubt that high school teachers need to be proficient in digital

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literacy. It can assist students to have a better understanding of the content. Thus, to become familiar with technology and improve TPCK, technology-related training activities should be provided as region-based workshops, division-based workshops and township-based workshops by inviting young talented experts and teachers.

Limitations

The limitation of this study was the population of only high school teachers in three divisions of Mandalay Region, Myanmar. Thus, it cannot cover the whole school of teachers in Myanmar. Further research studies should be conducted for specific school subjects with all profiles of teachers and other Basic Education High Schools as well. This study focused on only identifying the level of Technological Pedagogical Content Knowledge (TPCK) of high school teachers because of time limitations. Based on this study, further research studies about the importance of TPCK in implementing curriculum reforms and how to correlate them in Basic Education High Schools, Basic Education Middle Schools, Basic Education Primary Schools, Monastery Education and Private Schools should be carried out by using a quantitative method and a qualitative method to have a deeper understanding and clear description of this correlation. As a high school teacher, if I have a chance, I would like to conduct further research studies about TPCK and curriculum reforms.

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