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Preservice Teachers' Motivation and Adoption of 21st- Century Skills

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Abstract

In the current challenging educational landscape, institutions are evolving and changing to deliver high-quality education that nurtures 21st-century skills. Institutions that train teachers know the many challenges of nurturing these skills to meet new demands. Available research findings highlight the need to examine characteristics that motivate preservice teachers to incorporate essential 21st-century skills into their teaching practices. Hence, this study investigates Malaysian preservice teachers' intentions to adopt 21st-century skills, specifically, the relationship between motivation and the adoption of 21st-century skills. This study employed a sequential explanatory research design to collect survey data from 150 preservice teachers at two public universities and interview 10 participants. The findings revealed a positive relationship between the preservice teachers' motivation and the adoption of 21st-century skills in teaching. School mentors also played a facilitative role in the acquisition and adoption of 21st-century skills. These findings imply that schools can implement policies that equip preservice teachers with much-needed 21st-century skills. Action taken can be the catalyst for change in the development and promotion of the skills in students. In addition, the findings also provide clear directions for teacher training institutions to teach not only 21st-century skills but also collaborative skills that will facilitate the adoption of these skills to enable teachers to navigate the challenges of teaching in the 21st century.

Keywords: 21-st century skills, preservice teachers, motivation, digital competency, teaching skills.

Introduction

Educators in Malaysian higher education face numerous challenges relating to

student learning, as seen from the urgent issues raised in recent studies. These include the low level of resiliency of university students, low ability to think critically (Othman, 2017), and poor academic performance (Yusuf et al., 2020; Ayang & Richard, 2022; Ramli et al., 2021). It has been asserted that these issues have caused students not to meet certain academic standards and not to be equipped with skills that are necessary for workplaces, affecting the graduates' employability (Al Asefer & Abidin, 2021; Hamid et al., 2014). Educators, knowing the demand for these skills, are striving to equip students with core 21st-century competencies, but the challenges of incorporating 21st-century abilities into classroom instruction remain (Hadiyanto et al., 2021; Gümüs, 2022). The Ministry of Education wants Malaysian institutions to provide holistic information and skills to students to enable them to overcome the challenges of the 21st-century (Ministry of Education Malaysia, 2013). As a result, measures like the mentor-mentee programme (Siew, 2021), the thinking map programme (Hassan et al., 2016), and the use of integrated technology assessment tools (Sulaiman et al., 2021) have been implemented. However, teachers must possess the skills to develop them in students and encourage the use of these skills. Studies have shown ways in which 21st-century skills can be nurtured in teaching and learning (Vebrianto et al., 2020; Siaw, 2017). Hence, this study aims to examine the motivation of teaching among preservice teachers and their levels of adoption of 21st-century skills in their teaching. Other objectives are to find out the relationship of these two constructs and preservice teachers' experiences in adopting 21st-century skills. Four research questions (RQs), which are related mainly to their motivation in teaching and their adoption of 21st-century skills, are set as below. These RQs are used to guide the presentation of the results section.

RQ 1: What is the level of motivation in teaching among preservice teachers?
RQ 2: What is the level of adoption of 21st-century skills among preservice teachers?
RQ 3: Is there any relationship between motivation and the adoption of 21st-Century Skills in teaching practices among preservice teachers?
RQ 4: What are preservice teachers' experiences of adopting 21st-century skills?

Literature Review

Understanding 21st-Century Skills

21st-century skills can be defined as the skills that require anyone to perform and show abilities in managing information and competencies on the tasks or jobs given to them (Binkley et al., 2012). These abilities are even more important to manage increasing demands and expectations in an information-rich society. The abilities vary according to context. Information management was considered as an essential ability among academicians and job seekers in the early twenty-first century but with globalization and the rapid developments in technology, other abilities required to manage not only information but also other resources have become critically important. Hence, 21st-century skills have now been expanded to encompass skills for collaboration, problem-solving, critical thinking, and creative thinking. Although these skills are necessary for success in studies and work, the list is not exhaustive. It will continue to grow in keeping with new demands in the present century, and higher education providers must be fully

prepared to equip students with skills to meet the demands and expectations.

The Partnership for 21st-Century Skills (P21) (2009) has articulated an established vision for educational growth. The vision conceptualizes and integrates student outcomes and educational support systems for achieving 21st-century skills. The document has recommended that the standards and assessments, curriculum and instruction, professional development, and learning environments be linked to key academic topics, namely (1) life and career skills, (2) learning and innovative skills (4Cs -critical thinking, communication, collaboration, and creativity), and (3) information media and technology skills (Partnership for 21st-Century Skills, 2009). In line with this vision, Robinson and Knight (2019) identify four vital 21st-century skills: cooperation, critical thinking, communication, and creativity which need to be incorporated into lessons. However, it is acknowledged that the teaching of these skills is determined by a variety of factors such as the contents, the learning outcomes and the classroom environment, and needs to be creatively incorporated. For example, in teaching critical thinking skills in a language lesson Saleh (2019) highlights the need to empower students to make decisions, informed by their own understanding of the concepts taught, to drive a growth mindset, and facilitate the acquisition of the vital skills.

In Science, Technology, Engineering, and Mathematics (STEM) education, arguably, it may be much easier to incorporate all four skills (4C) into a STEM lesson than in a social science class. For instance, creativity and critical thinking are required in STEM lessons to solve problems. The mentor-mentee program that is implemented in STEM education in Malaysia allows mentees to collaboratively develop 21st-century competencies like creativity, critical thinking, and problem solving in managing projects (Siew, 2021). It is acknowledged that teamwork in STEM projects necessitates collaboration and communication, but the processes and workings are still not entirely clear as not much research has investigated the acquisition of these skills in classroom settings. Hence, it is imperative that research be conducted to inform educational practices.

Preservice Teachers and 21st-Century Skills

While action has been taken by policymakers, much needs to be done by students. Preservice teachers, like other young adults in higher education, are encouraged to bear some responsibilities to develop essential 21st-century skills that will help them succeed in their teaching careers. It is asserted that teachers need to use skills and knowledge to achieve goals in teaching (Silva, 2009). As preservice teachers will be teaching the younger generation, they must be role models for the students, displaying confidence in dealing with challenges and keeping abreast of technological developments to meet digital skills requirements. Above all, they need to evolve and refine their 21st-century skills to impart knowledge and skills (Partnership for 21st Century Skills, 2009).

The Malaysian Education Blueprint (Ministry of Education Malaysia, 2013) lists 10 shifts in higher learning education that need to be accelerated if Malaysia wants to remain competitive and advance in science and technology. The 10–10 Malaysian Science, Technology, Innovation, and Economy (MySTIE) Framework (Akademi Sains Malaysia, 2020) has been formulated to provide clear directions. Achieving global prominence and success in global online learning requires Malaysian students to be more active, communicative, knowledgeable, and skilled in leading and creating new ideas at all levels. Teachers play a critical role in this mission. They need to emphasize the

application of 21st-century skills. Preservice teachers must therefore improve their skills to interact with the young, employ effective teaching practices and expend more effort into integrating their skills to increase students' digital reading skills and other abilities (Mugot & Sumbalan, 2019).

Motivation of Preservice Teachers

Preservice teachers are mentored by professionals to develop essential teaching and learning skills. Being future leaders in education, they need to be self-motivating and proactive. Although studies have indicated that school leaders' motivation can influence teachers' motivation in the classroom (Lourmpas & Dakopoulou, 2014) and that motivation is essential to drive educational achievement (Han & Yin, 2016), not much research has examined preservice teachers' attitudes to skill improvement and self-reflection. Some research has assessed teachers' 21st-century skills (Kim et al., 2019), but the findings are still preliminary. Since these skills are very important, there is a need to explore preservice teachers' motivation for skill improvement and attitudes to upskilling essential 21st-century skills like digital, creativity, and critical thinking skills (Goodwin et al., 2015).

Methodology

This study employed a sequential explanatory research design to collect data on preservice teachers' teaching motivation and adoption of 21st-century skills during internship placements in schools, using a mixed-methods design that included two questionnaires that asked about 21st-century abilities and motivation, and a semi-structured interview protocol. Participants in the study were 150 preservice teachers from two selected universities in Malaysia. 72% were females, and 28% were males. 83.3% were mathematics majors, and 16.7% were science majors. A convenience sampling method was chosen for this study, as it is the most widely used sampling technique when using internet-based services (Edgar & Manz, 2017). The participants answered the Google Forms questionnaire. Following the survey administration, ten of the participants were interviewed by phone.

The first questionnaire (refer to Table 1) investigated five main constructs: creativity, critical thinking, collaborative skills, use of technology, and communication. Thirty items were adapted from Siaw (2017), but two items were discarded after validation by three experts. They were: "Create joint products using contributions from each student" (an item in creativity) and "Summarize or create their own interpretation of what they have read or been taught" (an item in critical thinking), In addition, several items were modified to better fit the scope of the study. One original item, "Generate their own ideas about how to confront a problem or question" was changed to "Guide the students to generate their own ideas about how to confront a problem or question" while another, "Present their group work to the class, teacher or others" was changed to "Work in a team to provide more ideas.". Table 1 presents some items from the constructs.

The second questionnaire consisted of 22 items on motivation covering three constructs: interest, confidence, and effort, which are factors proposed by Teoh, Koo, and Parmjit (2010) in research into mathematics education. For content validity, three experts

evaluated the items. Following the process, minor adjustments were made. A factor analysis was also conducted to establish construct validity. In the factor analysis, Kaiser–Meyer–Olkin (KMO=0.912) measure of sampling adequacy indicated a high variability of the data. Three components were extracted using a varimax method for 63.265% of the cumulative variance, shared by 22 items.

Table 1
Samples of Items for the Adoption of 21st-Century Skills and Motivation Questionnaires

Questionnaire	construct	Item (sample)
Adoption of 21st-Century Skills	Creativity (5 items)	Use idea creation techniques such as brainstorming or concept mapping
	Critical thinking (5 items)	Compare information from different sources before completing a task or assignment
	Collaboration (5 items)	Work in pairs or small groups to complete a task together
	Communication (5 items)	Convey their ideas using media other than a written paper (e.g., posters, video, blogs, etc.)
	Use of technology (8 items)	Select appropriate technology tools or resources for completing a task
Motivation	Interest (4 items)	I love to teach mathematics/science in secondary school.
	Confidence (5 items)	I am confident in my teaching after the practicum.
	Effort (13 items)	From my practicum experience, I gained pedagogical knowledge through interactions with other teachers.

Respondents were required to respond on a five-point Likert scale where a score of 1 indicated *strong disagreement*, whilst a score of 5 indicated *strong agreement*. A pilot test was conducted to establish the internal reliability, which stood at 0.918 and 0.923 for the adoption of 21st-century skills and motivation, respectively. The number of items per construct and sample of items are shown in Table 1. Descriptive and inferential statistics were generated by SPSS. The inferential statistics involved the Pearson product moment correlation. Assumptions included the level of measures in scale with the absence of outliers, and linearity.

The semi-structured interviews (refer to the appendix for a sample of interview transcripts) sought insights into preservice teachers' experiences of using communication, collaborative skills and other skills during their practicum. Ten preservice teachers, referred to as Preservice Teachers (PT), were interviewed. Their interview data were recorded as PT1, to PT10 and analyzed using thematic analysis.

Results

The following analyses aim to answer the four research questions (RQ).

Finding 1: Preservice Teachers' Motivation

Table 2 presents descriptive statistics to answer the first research question.

RQ 1: What is the level of motivation in teaching among preservice teachers?

Table 2 shows the means and standard deviations of the preservice teachers' motivational factors: interest, confidence, and efforts in teaching. They rated higher motivation in interest (M = 4.37, SD = 0.59). Next, it was followed by the teacher's confidence (M = 4.28, SD = 0.59) and teacher's effort (M = 4.26, SD = 0.54). The overall mean (M) for preservice teachers' motivation was 4.31 (SD = 0.58).

Table 2
The Level of Preservice Teachers' Motivation

Teachers' Motivation	Mean (M)	Std. Deviation (SD)
Teacher's Interest	4.37	0.59
Teacher's Confidence	4.28	0.59
Teacher's Effort	4.26	0.54
Total (Teacher's Motivation)	4.31	0.58

Note: The Likert scale for measuring motivation was set as 5 for '*highly motivated*' to 1 for '*least motivated*'

Finding 2: Preservice Teachers' Adoption of 21st-Century Skills

Table 3 presents descriptive statistics to answer the second research question:

RQ 2: What is the level of adoption of 21st-century skills among the preservice teachers? Table 3 shows that the preservice teachers considered themselves skilful at utilizing collaborative skills (M = 4.25, SD = 0.61) in teaching since they rated them as the highest among the skills. Next were creativity skills (M = 4.22, SD = 0.50), communication skills (mean = 4.15, SD = 0.59) and use of technology (M = 4.11, SD = 0.51). However, they rated the lowest in critical thinking skills (M = 4.05, SD = 0.51). The total for all the skills, adoption of 21st-century teaching skills was moderately high (M = 4.15, SD = 0.44). Thus, it can be concluded that most respondents have a high level of adoption of 21st-century teaching skills, specifically for mathematics.

Table 3
The level of Preservice Teachers' Level of Adoption of 21st-Century Teaching Skills

Adoption of 21st-Century Teaching Skills	Mean (M)	Std. Deviation (SD)
Creativity	4.22	0.50
Critical Thinking	4.05	0.51
Collaboration	4.25	0.61
Use of Technology	4.11	0.51
Communication	4.15	0.59
Total (Adoption of 21st-Century Teaching Skills)	4.15	0.44

Note: The Likert scale for measuring motivation was set as 5 for '*strongly agree*' to 1 for '*strongly disagree*'

Finding 3: Relationship between Motivation and Adoption of 21st-Century Skills

Table 4 presents a correlational analysis to answer the third research question:

RQ 3: Is there any relationship between motivation and the adoption of 21st-Century Skills in teaching practices among the preservice teachers?

A Pearson correlation (Table 4) was conducted to determine the relationship between motivation and adoption of 21st-century teaching skills showing that $r(150) = .638$ and, $p < .05$, revealing a significantly moderate positive relationship between the two variables. In other words, as motivation increases, the adoption of 21st-century teaching skills also increases, or vice versa.

Table 4
A Correlation Analysis

		Teachers'-Motivation
Adoption of 21st-Century Teaching Skills	Pearson Correlation	0.638**
	Sig. (2-tailed)	0.000
	N	150

**Correlation was significant at the 0.05 level (2-tailed)

Finding 4: Preservice Teachers' Experience of Adoption of 21st-Century Skills

The following analyses were derived from interview data to answer the fourth research question:

RQ 4: What are preservice teachers' experiences of adopting 21st-century skills?

A thematic analysis revealed that the preservice teachers were guided by school mentors who were experienced teachers during their practicum. Most were actively utilizing the skills to teach. All of them reported that they liked to communicate with their mentors in school since the mentors were willing to share creative and innovative methods in teaching. Clearly, preservice teachers benefited from their mentors' experiences, as expressed by PT1 below:

> PT1: I often ask the math teacher at the school especially when I do not know how. I can explain a question to students easily. From there, the math teacher gave me a lot of ideas and opinions that I could use while in the classroom.

They also found that the practicum was a good arrangement for them to learn more about 21st-century skills since the mentors shared real-life teaching experiences. Interestingly, PT8 said that she was grateful to have her mentor guiding her on 21st-century skills:

> PT8: The headmaster is very nice and kind. I love her character and how she. recommends ways to apply 21st-century skills in the class as our school is very

> keen to adopt 21st-century skills in teaching and learning. For example, teachers guide us on enhancing 21st-century skills in the learning process, like group activities, pair work, use of quizzes and rewards.

This study also highlights the importance of communication skills in classroom teaching since classroom management requires the skills not only to control but to engage the students. All the preservice teachers explained that they appreciated the good communication they had in the school. The following statement was made by PT6:

> PT6: I had experience communicating with the vice principal ('Hal Ehwal. Akademik' or Academic Affairs) about the ways to handle 40 students in a class.

They were focusing on engaging students in class. This effort is important in order to nurture 21st-century skills in classroom teaching. PT9 revealed:

> PT9: I like to communicate with other teachers, especially in sharing tips on how to handle students. For example, the teacher reminds us that upon entering the class, we need to make sure that all students are ready to learn before we start because if we are not mindful of those issues, students might sleep or not focus while we are teaching because they will feel that teachers are not concerned about their behavior.

The interviews revealed that the preservice teachers appreciated all support and opportunities given to them. They used all available resources to improve their pedagogical skills in their classroom teaching. By refining these skills, they were able to improve their teaching. Hence, it is crucial for them to actively communicate with their mentors as well as students. Communication is a major skill for career development in teaching.

Discussion

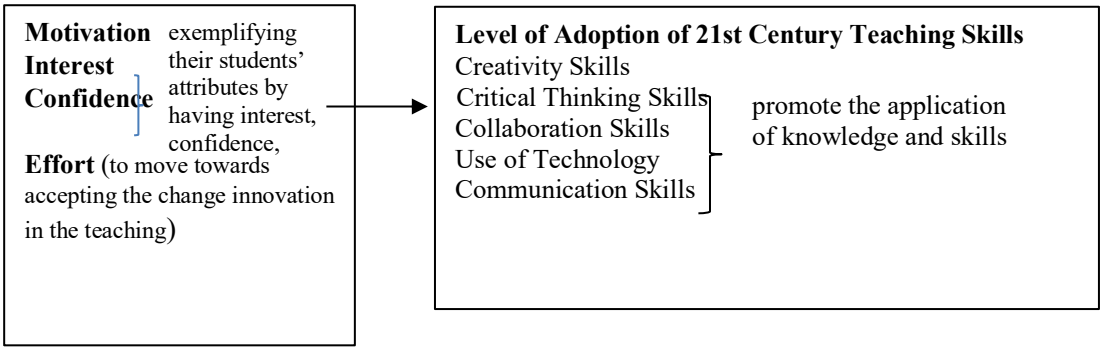
The preservice teachers in the current study had a moderate to high level of motivation. This could be attributed to their participation in preparatory programs although they did not attend any study courses during their practicum. Most teacher preparation programs aim to produce teachers with 21st-century knowledge and abilities. The findings on 21st-century abilities have highlighted the need to improve technology, pedagogy, and content, consistent with practices elsewhere (American Association of Colleges for Teacher Education, 2008). Preservice teachers, however, seem unsure of their ability to apply all these skills in classroom contexts. Motivation has always been a potential solution to solving some issues in teaching. Even though the preservice teachers showed their interest and confidence in the adoption of 21st-century skills, they would need more support to apply integrated skills, such as class management skills, since teaching activities not only develop students' skills but refine the teachers' 21st-century skills (Mugot & Sumbalan, 2019).

On the adoption of 21st-century skills, the preservice teachers rated themselves moderately high. The results indicate that the university courses equipped the student teachers with these skills. Courses appeared to be well designed and match current needs,

in line with the Partnership for 21st Century Skills (2009). The use of project-based teaching methods and appropriate assessment strategies, in addition to actively engaging students in a supportive learning environment, seems to be effective. The preservice teachers also drew attention to their own university learning environment. This finding indicates that the reported teaching and learning practices are consistent with the P21 framework.

On the relationship between preservice teachers' motivation for adopting 21st-century skills and their actual use of the 21st-century skills in teaching, the results showed a positive and significant relationship between the preservice teachers' motivation and the adoption of 21st-century skills. The positive relationship indicates preservice teachers' acceptance of the new skills in teaching and learning. Their willingness to accept new learning, such as technological skills, is reassuring (Sharma & Srivastava, 2019). Their motivation could underpin further learning and refinement of their skills. The teachers rated the highest motivation in interest, confidence, and effort to adopt the skills. It shows their acceptance of change and innovation in teaching. Their efforts to accept change can drive curricula development and instructional methods innovation (Ponticell, 2003).

Figure 1
Preservice Teachers' Motivation and the Adoption Level of 21st-century Skills



The preservice teachers' awareness (simplified in Figure 1) of their responsibilities may propel them to adopt best practices to achieve teaching and learning outcomes outlined in the curriculum (Ministry of Education Malaysia, 2013). By fulfilling their responsibilities, they become role models to their students, inspiring them and facilitating the development of interest in school and 21st-century skills in educational settings. Preservice teachers also learn to take risks as they apply knowledge and skills that use state-of-the-art pedagogical tools and technology (Goodwin et al., 2015). There is always the need to focus on preservice teachers since they are new, still unsure of their professional expertise (Shanks, 2014). Thus, universities must organize more teacher induction programs (Shanks, 2020). There is also a need to help them develop appropriate strategies to deal with challenges that arise in a school system (Johnston, 2020). Being inexperienced, preservice teachers need coaching to enable them to collaborate and communicate well in the community. Throughout their practicum, the preservice teachers received their mentors' guidance and support, which they appreciated. Assistance and coaching are especially important in developing the skills necessary to achieve learning outcomes (Partnership for 21st Century Skills, 2009). Finally, the findings of this study have provided directions for professional development by

highlighting preservice teachers' learning experiences, use of 21st-Century Skills and collaboration between senior teachers and junior or preservice teachers. For example, senior teachers may need junior teachers or preservice teachers to address issues relating to the implementation of ICT, confirming the findings of work done earlier (Cai & Gut, 2020). This study has also drawn attention to the need for preservice teachers to explore digital literacy, especially digital and thinking development, which is compatible with previous research findings (List et al., 2020).

Conclusion

This research aimed to investigate preservice teachers' motivation and the adoption of 21st-century skills. This study provided insights into how the teachers use 21st-century skills in their practicum. Findings highlighted a significant positive relationship between teachers' motivation and their adoption of 21st-century skills in classrooms. Most teachers were highly motivated, actively incorporating 21st-century skills into their practicum, but saw themselves as less confident, needing support from mentors in the schools, likely due to their lack of experience in addressing challenges in teaching. It is argued that communication and collaborative skills will help less experienced teachers to navigate these challenges. All expressed the desire to work with experienced and resourceful mentors in school. Considering the important role to be played by preservice teachers, the mentor-mentee program could be strengthened to ensure new teachers stay highly motivated and use best practices that are aligned with the P21 framework to equip students with 21st-century skills. Universities that prepare preservice teachers must implement policies that will provide more support and opportunities for them to acquire essential skills and drive their desire to continuously refine their skills to meet the demands of the 21st century. While some useful insights into preservice teachers' practicum experiences have been obtained from the present study, the findings remain preliminary. Future research can use state-of-the-art technology to observe preservice teachers' applications of 21st-century skills in their classrooms. The recordings could also be used to encourage reflection on best practices. Further research can explore specific 21st-century skills needed for other fields.

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Appendix

"I" represents the interviewer
"PT" represents a participant

I: "Do you like to communicate with the mathematics teachers in the school?"

PT1: Yes
PT5: I like to communicate with other teachers because they are very friendly and willing to share their experiences with me.
PT9: I like to communicate with other teachers, especially in sharing tips on how to handle students. For example, the teacher shared that once entering the class we need to make sure that all students are ready.

I: Please share examples and contents of the discussion with the teachers.

PT1: They share their views on how we can attract students in the classroom, especially naughty students.
PT2: My mentor gives the best suggestion for me to teach the Form One students that I handle.
PT3: She is really helpful and generous to give some tips and teach me on certain topics that I am confused about.

PT5: I have got some sharing from my biology teacher about the effective way to manage our classroom.
PT6: I had experience communicating with vice principal (Hal Ehwal Akademik) about the ways to handle 40 students in a class.
PT8: My mentor also provides me with many materials that I need to teach that class, for example by giving me exercise books and textbooks.
PT8: The headmaster is very nice and kind. I love her character and how she suggests to us mathematics teachers the ways to apply 21st-century skills in the class as our school is very keen to adopt the 21st-century in the teaching and learning process. For example, teachers guide us to enhance 21st-century skills in learning process like grouping activities, pairing, give some quiz and reward to them.
PT9: The teachers are willing to share about how they teach the students, how to handle them and how to prepare materials.

I: How do you take opportunities to learn more about teaching mathematics in schools?

PT1: I often ask the math teacher at the school especially when I do not know how I can explain a question to students easily. From there, the math teacher at the school gave me a lot of ideas and opinions that I could do while in the classroom.
PT1: Teacher gave me tips to explain to the students by using step by step. This is because not all students can easily understand that topic. So that way gives better understanding for students in my class.
PT4: I have asked some of mathematics teachers' permission to make observations when they have class with their students.
PT6: I used different types of teaching tools for three classes as their level of understanding was quite different. For instance, for the excellent class I will use handout meanwhile for bottom class I will use grouping.
PT7: Some ways that I do to improve my mathematics teaching are by joining and observing my mentor class and other teacher mathematics class.
PT8: My mentor also provides me with many materials that I need to teach that class for example by giving me exercise books and textbooks.