SMART TEACHING PRACTICES OF JUNIOR HIGH SCHOOL TEACHERS UNDER THE KHON KAEN UNIVERSITY (KKU) SMART LEARNING PROJECT

การสอนแบบสมาร์ตของครูระดับมัธยมศึกษาตอนต้น

ในโครงการนวัตกรรมการเรียนรู้แบบสมาร์ตของมหาวิทยาลัยขอนแก่น

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ABSTRACT

Changing the quality of education in Thailand A part of this emphasize on the development of teacher competencies that is important to the classroom. Learning conditions and teaching methods to lead the development of smart teaching. This research aimed to study the situations of smart teaching practices of junior higher school teachers under the KKU Smart Learning Project of Khon Kaen University that were based on four main aspects: 1) defining learning outcomes and lesson plan, 2) application of teaching methods and learning activities, 3) managing learning environments, and 4) measurement and evaluation. The study employed a quantitative research design. Data were collected by administering a questionnaire to a sample of 1,226 out of 1,500 possible respondents who were junior higher school teachers from 205 junior higher schools located in 20 provinces in the Northeastern region of Thailand. The results of the study revealed that the teachers applied smart teaching practices in all four aspects comprised of defining learning outcomes and lesson plan, the application of teaching methods and learning activities, managing learning environments, and measurement and evaluation of learning outcomes at a high level. Learning environment management, particularly, was applied in their classes most often to encourage students to share their ideas and listen to others' opinions both in their on-site and online classrooms. In addition, digital technology and computer applications were used for managing the learning environment, recording learning outcomes, and monitoring learners' behaviors.

Keywords : Smart teaching, Smart learning, Learning outcomes, Junior high schools

บทคัดย่อ

การเปลี่ยนแปลงคุณภาพการศึกษาของไทย ส่วนหนึ่งมุ่งเน้นการพัฒนาสมรรถนะครูจำเป็นอย่างยิ่ง

ต่อการเปลี่ยนแปลงชั้นเรียน สภาพการเรียนรู้และวิธีการสอนเพื่อนำไปสู่การพัฒนาการสอนแบบสมาร์ต งานวิจัย

นี้จึงมีวัตถุประสงค์เพื่อศึกษาสภาพการสอนแบบสมาร์ตของครูระดับมัธยมศึกษาตอนต้น ในโครงการนวัตกรรมการ

เรียนรู้แบบสมาร์ตของมหาวิทยาลัยขอนแก่น ซึ่งมีแนวคิดการสอนแบบสมาร์ตประกอบด้วย 1) การกำหนดผลลัพธ์การเรียนรู้และการวางแผนการจัดการเรียนรู้ 2) วิธีการสอนและการจัดกิจกรรมการเรียนรู้ 3) การจัดสภาพแวดล้อมการเรียนรู้ และ 4) การวัดและประเมินผลการเรียนรู้ ใช้วิธีวิจัยเชิงปริมาณ เก็บรวบรวมข้อมูลโดยใช้แบบสอบถามที่มีค่าความเชื่อมั่นทั้งฉบับเท่ากับ 0.98 โดยส่งไปยังกลุ่มเป้าหมายด้วยวิธีการเลือกกลุ่มตัวอย่างแบบเจาะจงซึ่งเป็นครูในโรงเรียนระดับมัธยมศึกษาตอนต้น (ม.1-ม.3) ในภาคตะวันออกเฉียงเหนือ 205 แห่ง จำนวน 1,500 ชุด ได้รับกลับคืน 1,226 ชุด นำมาวิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนาหาค่าร้อยละ ค่าเฉลี่ย ค่าส่วนเบี่ยงเบนมาตรฐานและค่าน้ำหนักองค์ประกอบ ผลการวิจัยพบว่า ครูได้นำแนวคิดการสอนแบบสมาร์ตไปใช้ในการจัดการเรียนการสอนในระดับมากทั้ง 4 ด้าน ได้แก่ 1) การกำหนดผลลัพธ์การเรียนรู้และการวางแผนการจัดการเรียนรู้ 2) วิธีการสอนและการจัดกิจกรรมการเรียนรู้ 3) การจัดสภาพแวดล้อมการเรียนรู้ และ 4) การวัดและประเมินผลการเรียนรู้ โดยเฉพาะอย่างยิ่ง การจัดสภาพแวดล้อมการเรียนรู้ ซึ่งครูได้มีการกระตุ้นให้นักเรียนแลกเปลี่ยนและรับฟังความคิดเห็นของเพื่อนร่วมชั้นทั้งในการสอนแบบในชั้นเรียนและแบบออนไลน์ นอกจากนี้ ครูได้ใช้เทคโนโลยีดิจิทัลและคอมพิวเตอร์ในการจัดสภาพแวดล้อมการเรียนรู้ การบันทึกผลลัพธ์การเรียนรู้ และการติดตามพฤติกรรมการเรียนรู้ของนักเรียนด้วย

คำสำคัญ: การสอนแบบสมาร์ต, การเรียนรู้แบบสมาร์ต, ผลลัพธ์การเรียนรู้, โรงเรียนมัธยมศึกษาตอนต้น

INTRODUCTION

The goal of education is to achieve quality outcomes by supporting student's capacity to learn, encourage them to reach the achievement (Ministry of Education, Thailand, 2022, online). Teachers are the person to produce as a result on student comprehension and successful (Hattie, 2009, p. 34), even though teacher effectiveness has been continuously reprimanded and the ultimate goal of educational qualities to be critical (Klassen & Tze, 2014, p. 61). Apparently, little intention of teacher effectiveness research in order to the complexation and intellectual demand of teaching in differences in teachers' cognitive skills referred to intelligence (Harris & Rutledge, 2010, p. 920). The perception of digital competence for teachers has also emerged strongly, referring to the knowledge, skills, and attitudes required by educators to support student learning in today's digital world (Hall, Atkins, & Fraser, 2014, pp. 5-6). To reach the goals, teachers are main pillars of education circle. They are moderate play this role for develop our student and to training smart teaching in digital environment in school for them to move forward. Smart teacher ability able to integrate and use technology for teaching methods and purposes involves having a set of generic skills compromised with all of learning situations.

A teacher as the main actor that is very vital in running education, which is one of the most important aspects in the 4.0 industrial revolution era (Ningsih, 2019, p. 59). Teachers in this era assumed that digital competence for them should be acquired at school, it has consequently resulted in widespread attention in the educational research arena where there now exists a significant body of research in the scope of digital competence for teaching and in teacher competencies more specifically (García-Tudela, Prendes-Espinosa, & Solano-Fernández, 2021, p. 2). Therefore,

teachers still slow improve and accomplished in appropriate methods, tools, and learning skill set and develop them become a smart teacher effectively and consistently in an actual situation. Lund et al. (2014, p. 283) referred to as teacher professional digital competence means who being able to integrate and use technology for educational purposes involves having a set of generic skills suitable for all situations, both personal and professional, as well as specific teaching-profession skills. The experience with use of technology that pre-service teachers acquire during teacher education, both through their own use and by observing teacher educators' use, is a crucial factor for their development of professional digital competence, and as found, for their attitudes (Knezek & Christensen, 2008, pp. 325-326). New approach of teaching research bring technology integration into teaching method to take place, teachers need access to relevant equipment, workplace support and positive attitudes towards technology (Ertmer et al., 2012, p. 431).

KKU Smart Learning program (KKUSLA) is the integrated research and community outreach project initiated by Khon Kaen University cooperated with Ministry of Education of Thailand to develop students' learning competencies in junior-high schools in Northeast of Thailand. KKUSLA's core concept is aiming on improving students' learning competencies by changing the classroom environments and the teaching approaches of teachers by focusing on the students' learning styles in the digital age (Tuamsuk, 2018, pp. 1-2). The smart teaching approach, therefore has been developed in order to train the teachers and then the teachers implemented the approach in their class teaching. The smart teaching of KKUSLA comprised of four key components of which all teachers need to have such abilities to teach in schools, including 1) defining learning outcomes and lesson plan, 2) application of teaching methods and learning activities, 3) managing learning environments, and 4) measurement and evaluation. Teachers of three subjects; mathematics, science and English in 205 medium-sized junior high schools were trained and implemented the smart teaching approach in their subject classes. The program has been conducted for four years, from academic years of 2017 to 2020. The students' learning competencies have been evaluated according to the program's objectives and found that their competencied have been significantly developed. It also revealed that the smart teaching of KKUSLA is an appropriated teaching and learning method for enhancing the students' learning development (Tuamsuk, 2020, p. 4).

RESEARCH OBJECTIVES

The objective of this research was to study the situation to what extent smart teaching practices were applied in junior higher school classrooms in Thailand based on four main aspects consisting of 1) defining learning outcomes and lesson plan, 2) the application of teaching methods and learning activities, 3) managing learning environments, and 4) measurement and evaluation of learning outcomes.

RESEARCH BENEFITS

This paper to enlighten the smart teaching practices as a new teaching concept and tendencies that teacher help to understand contents, teaching methods, learning activities, and measurement and evaluation among the digital learning environment.

Related Literature

Various literatures have described the important of smart teaching. Apparently, one of the main factors that contributes to the success of smart teaching that how teacher teach students, how they integrate innovate their way of teaching to meet the characteristics of digital learning environment in this era. According to purpose of article, we defined smart teaching as the teaching approach that embraced new teaching and learning methods in accordance to students' learning styles in the digital environments in order for developing smart learners (Tuamsuk, 2020, pp. 4-5).

Previous studies in this field, most of smart person research area focused on human learning supports the use of teaching strategies that engage the learner with opportunities to practice new skills, new experiences and mistakes and reflect on their experiences as a method to connect student understanding and subsequent transfer of concepts to practice. As if teacher understand what is known about human learning can assist educators in making informed decisions about teaching and in intentionally aligning a teaching approach with learning goals (Bransford, Brown, & Cocking, 2000, p. 204; Ambrose et al, 2010, p. 2). Moreover, Borisova et al (2016, p. 1176) supported by smart education as the term of modern teacher become one of essential topic in the field of education research and new teaching has become a new hot spot in the current education information research and teachers' performance in using digital tools through the internet will influence how students face them as the ones to be modelled and trusted (Shi, 2016, p. 49; Ningsih, 2019 p. 58).

To illustrate the gap, Pashler et al. (2008, p. 105) extended that teacher select to apply technology in their teaching methods may thus directly influence their students' attitudes and dispositions towards integrating technology in their future classrooms. Besides, there is reason to believe that technology is less frequently used in teacher education than in primary education. For instance, analyses of curriculum documents for teacher education in Norway confirm that digital competence and use of technology is not effectively integrated into the curriculum neither at a subject specific level nor at an overall programme level (Instefjord & Munthe, 2016, pp. 77-93).

According to Pashler et al. (2008, pp. 106-107) and Vaseghi, Ramezani, and Gholami (2012, p. 444), learning style is the behaviors relating to individual learner difference in terms of cognitive, emotional, physiological aspects, and these can describe how the learners responding to the learning activities and environments in which the mode of teaching is the most effective for them. Therefore, the understanding of the learning styles helps teachers choose appropriate teaching

approaches to enhance teaching effectiveness. It is important for teachers to design lessons and create a pleasant learning atmosphere in the classroom to pay attention to students and motivate learning needs. Therefore, the design of a learning environment with the integration of technology is very crucial to create student's learning. It can be seen that technology has been used in digital education to create a flexible learning environment and increase learning interests. According to Radović, Marić and Passey (2019, p. 107), the integration of technology in a course creates better interaction and collaboration.

RESEARCH METHODOLOGY

This research was quantitative research by using a survey. The subjects of the study were junior higher school teachers who taught science, mathematics, and English subjects in the schools that participated in the KKU Smart Learning Academy Program during the academic year 2017-2020 (Tuamsuk, 2020, pp. 1-2). The research instrument was a questionnaire developed following the Smart Teaching Practices concept. The questionnaire was a 5-rating scale questionnaire when 1 referred to the lowest or strongly disagree level and 5 referred to the highest or the strongly agree level. The questions were divided into four aspects concerning 1) defining learning outcomes and lesson plan, 2) the application of teaching methods and learning activities, 3) managing learning environments, and 4) measurement and evaluation of learning outcomes. The questionnaire was evaluated by experts and tried out with 30 subjects who were not in the main study.

Table 1 Cronbach's alpha coefficient analysis for the questionnaire reliability

Smart Teaching	No. of items	Cronbach's Alpha	Mean	S.D.
1. Defining learning outcomes and lesson plan	10	0.924	4.15	0.565
2. Application of teaching methods and learning activities	10	0.917	4.16	0.751
3. Managing learning environments	10	0.936	4.26	0.736
4. Measurement and evaluation of learning outcomes	10	0.928	4.29	0.708

The reliability of the questionnaire was analyzed by using Cronbach's Alpha Coefficient, and the results were 0.917 to 0.936 representing a high level of reliability (Table 1). The data were collected by sending emails to 1,500 junior higher school teachers in the schools that participated in the KKU Smart Learning Program from January to May 2021, and there were 1,226 returns (81.73%). The data were analyzed by using percentage, mean, standard deviation, and exploratory factor analysis (EFA). The study was conducted in accordance with the Declaration of Helsinki, and reviewed by the Institutional Ethics Committee of Khon Kaen University, Khon Kaen, Thailand (HE653006).

RESEARCH RESULTS

1. **The demographic data of the respondents collected from the samples explained**

Table 2 Demographic data of the respondents

Demographic data		N (1,226)	%
Sex	Male	313	25.53
	Female	913	74.47
Teaching experiences (years)	Less than 5	336	27.40
	6-10	286	23.30
	11-15	190	15.50
	16-20	106	8.60
	More than 20	308	25.10
Teaching subject	Science	434	35.40
	Mathematics	385	31.40
	English	407	33.20
Teaching Class	Grade 7	444	36.22
	Grade 8	362	29.53
	Grade 9	420	34.26

The respondents were 1,226 junior higher school teachers who were female (74.47%) and male (25.53%). Most of the respondents had less than five years of teaching experience (27.4%) followed by more than 20 years (25.1%) and 6-10 years of teaching experience (23.3%), respectively. Categorized by their responsible subjects, they taught science subjects (35.40%), mathematics (31.40%), and English subjects (33.20%). Categorized by their responsible levels, they were responsible for teaching Grade 7 (35.40%), Grade 8 (31.40%), and Grade 9 (33.20%) (Table 2).

2. **Smart teaching practices of junior higher school teachers**

The results of the smart teaching practices of junior higher school teachers revealed that the teachers applied the smart teaching practices in all four aspects at the high level.

Table 3 Smart teaching practice of teachers at secondary schools

Smart teaching	Mean	S.D.	Factor loading
1. Defining learning outcomes and lesson plan	**4.15**	**0.565**	**0.617**
1.1 I analyze and set the expected learning outcomes by integrating curriculum standards and needed competency in the 21st century	4.16	0.751	0.569
1.2 I set the expected learning outcomes based on competency development - knowledge, skills, and individual competency.	4.26	0.736	0.606
1.3 I manage lesson plans that are consistent with the expected learning outcomes by completely setting objectives, topics, activities, and measurement and evaluation of my subject.	4.29	0.708	0.655

Table 3 (Continewed)

Smart teaching	Mean	S.D.	Factor loading
1.4 I plan for applying new teaching techniques to my class.	4.12	0.712	0.646
1.5 I plan for a variety of learning activities by integrating modern technology into classes.	4.13	0.732	0.689
1.6 I plan for using various learning resources from in and outside of the classroom and digital resources to support students' learning in my subject.	4.06	0.764	0.661
1.7 I plan for using digital technology in learning management to be consistent with learners' behaviors of the digital era.	4.11	0.746	0.705
1.8 I plan for various types of measurement and evaluation that are consistent with the expected learning outcomes for individual and group activities.	4.27	0.695	0.611
1.9 I analyze and review lesson plans regularly to improve and develop the plans to suit my students.	4.07	0.729	0.532
1.10 I use students' and stakeholders' feedback for improving and developing my learning management.	4.04	0.765	0.493
2. Application of teaching methods and learning activities	**4.17**	**0.551**	**0.488**
2.1 I inform students of the class objectives, contents, the process of learning, and measurement and evaluation before class.	4.43	0.709	0.561
2.2 I set activities or situations to interest students before class.	4.19	0.716	0.418
2.3 I use new teaching techniques rather than lectures to support students' learning.	4.15	0.717	0.561
1.4 I use digital technology in learning management and learning activities to develop learners' digital literacy.	4.08	0.765	0.598
1.5 I assign students activities to support students' understanding by performing actions as individuals and in groups.	4.24	0.715	0.424
2.6 I use techniques and tools for demonstrating the process or procedure of learning to let students see the authentic or real situations.	4.05	0.751	0.502
2.7 I use techniques and tools for encouraging students to ask and answer, express ideas, or test their competency of what they have learned.	4.10	0.696	0.479
2.8 I create opportunities for students to collaborate in forming knowledge in and outside of the classroom.	4.29	0.706	0.443
2.9 I assign students tasks that support them to learn, interact, and question on social media appropriately.	4.05	0.792	0.467
2.10 I regularly review and summarize lessons to check students' competency of the topic.	4.17	0.706	0.497
3. Managing learning environments	**4.02**	**0.637**	**0.633**
3.1 I support students to set their learning goals based on the learner-centered approach.	4.17	0.738	0.515
3.2 I manage my classroom environment to be integrated with technology and learning supportive tools as a smart classroom or a smart classroom-like environment.	3.80	0.915	0.583
3.3 I create a physical environment and learning atmosphere that encourages students to search for knowledge on their own from different resources and the Internet.	4.06	0.812	0.666
3.4 I create a physical environment and learning atmosphere that encourages students' collaborative learning.	4.21	0.722	0.658

Table 3 (Continewed)

Smart teaching	Mean	S.D.	Factor loading
3.5 I create a learning environment that encourages students to share their ideas and listen to others' opinions both in their on-site and online classrooms.	4.12	0.750	0.702
3.6 I create a learning environment that encourages students' collaborative learning in various styles.	4.16	0.725	0.674
3.7 I create a learning environment that supports students to improve their thinking skills and solve problems that are based on real-life and led to the utilization.	4.06	0.748	0.658
3.8 I integrate digital literacy development skills in my classroom.	4.03	0.786	0.602
3.9 I support students to learn from their communities and integrate knowledge from the community into my classroom.	3.90	0.856	0.650
3.10 I support students to learn from the knowledgeable people in their communities and created a learning community between learners and communities on-site and/or in an online classroom.	3.76	0.915	0.622
4. Measurement and evaluation of learning outcomes	**4.07**	**0.622**	**0.648**
4.2 I use various types of measurement and evaluation that are consistent with the expected learning outcomes for individuals and in groups evaluation.	4.26	0.707	0.652
4.2 I use measurement and evaluation before their teaching to check students' general knowledge and their readiness.	4.13	0.772	0.575
4.3 I set measurement and evaluation topics that are consistent with the objectives, contents, and real situations.	4.25	0.691	0.690
4.4 I use formative evaluation during classroom activities to check whether learners have developed their competency based on the objectives of the activities.	4.14	0.739	0.630
4.5 I use diagnostic evaluation to figure out learners' problems and solve them.	3.96	0.801	0.515
4.6 I use summative evaluation after activities to check learners' learning outcomes.	4.22	0.716	0.661
4.7 I use digital technology and computer applications for creating measurement or evaluation tools such as Kahoot or Google Form.	3.97	0.918	0.734
4.8 I use digital technology and computer applications for recording learning results and monitoring learners' behaviors in individuals and in groups.	3.92	0.895	0.719
4.9 I use self-evaluation to let students evaluate their understanding of the lessons and evaluate their skills learned from each lesson.	3.98	0.848	0.651
4.10 I let students evaluate my efficiency in terms of knowledge, teaching, and the teacher's characteristics of my responsible subjects.	3.95	0.868	0.648

The results of exploratory factor analysis (EFA) showed that all four aspects were appropriate for analyzing the smart teaching practices of junior higher school teachers because the factor loadings (ß) of all factors were 0.488 to 0.648. To clarify, the highest factor loading was of application of the teaching methods and learning activities aspect ($\overline{X}$ =4.17, ß=0.488) followed

by defining learning outcomes and lesson plan aspect ($\overline{X}$ =4.15 , ß=0.617) , measurement and evaluation of learning outcomes aspect ($\overline{X}$ =4.07, ß=0.648), and managing learning environments aspect ($\overline{X}$ =4.02, ß=0.633), respectively (Table 3).

The situations of smart teaching practices of junior higher school teachers were as follows:

2.1 Defining learning outcomes and lesson plan

The results of EFA showed that the factor loadings (ß) of all factors were 0.493 to 0.705 showing that all factors were appropriate for analyzing the smart teaching practices of junior higher school teachers in the defining learning outcomes and lesson plan aspect. The highest factor loading was of teachers planning for using digital technology in learning management to be consistent with learners' behaviors of the digital era (ß=0.705). The teachers planned for a variety of learning activities by integrating modern technology into classes (ß=0.689). The teachers planned for using various learning resources from in and outside of the classroom and digital resources to support students' learning in their subjects (ß=0.661). The teachers managed lesson plans that were consistent with the expected learning outcomes by completely setting objectives, topics, activities, and measurement and evaluation of their subjects (ß=0.655). The teachers planned for applying new teaching techniques to their classes (ß=0.646). The teachers planned for various types of measurement and evaluation that were consistent with the expected learning outcomes for individual and group activities (ß=0.611). The teachers set the expected learning outcomes based on competency development (ß=0.606). The teachers analyzed and set the expected learning outcomes by integrating curriculum standards and needed competency in the 21st century (ß=0.569). The teachers analyzed and reviewed lesson plans regularly to improve and develop the plans to suit their students (ß=0.532). Finally, the teachers used students' and stakeholders' feedback for improving and developing their learning management (ß=0.493).

The levels of applying the smart teaching practices in the defining learning outcomes and lesson plan aspect were at high levels in all processes. The highest level was of teachers managing lesson plans that are consistent with the expected learning outcomes by completely setting objectives, topics, activities, and measurement and evaluation of my subject ($\overline{X}$ =4.29) followed by teachers planning for various types of measurement and evaluation that are consistent with the expected learning outcomes for individual and group activities ($\overline{X}$ =4.27) and teachers setting the expected learning outcomes based on competency development - knowledge, skills, and individual competency ($\overline{X}$ =4.26), respectively.

2.2 Application of teaching methods and learning activities

The results of EFA showed that the factor loadings (ß) of all factors were 0.418 to 0.598 showing that all factors were appropriate for analyzing the smart teaching practices of junior higher school teachers in the application of teaching methods and learning activities aspect.

The highest factor loading was of teachers using digital technology in learning management and learning activities to develop learners' digital literacy (β=0.598). The teachers used new teaching techniques rather than lectures to support students' learning (β=0.561). The teachers informed students of the class objectives, contents, the process of learning, and measurement and evaluation before class (β=0.561). The teachers used techniques and tools for demonstrating the process or procedure of learning to let students see the authentic or real situations (β=0.502). The teachers regularly reviewed and summarized lessons to check students' competency of the topic (β=0.497). The teachers used techniques and tools for encouraging students to ask and answer, express ideas, or test their competency of what they have learned (β=0.479). The teachers assigned students tasks that support them to learn, interact, and question on social media appropriately (β=0.467). The teachers created opportunities for students to collaborate in forming knowledge in and outside of the classroom (β=0.443). The teachers assigned students activities to support students' understanding by performing actions as individuals and in groups (β=0.424). Finally, the teachers set activities or situations to interest students before class (β=0.418).

The levels of applying the smart teaching practices in the application of teaching methods and learning activities aspect were at high levels in all processes. The highest level was of teachers informing students of the class objectives, contents, the process of learning, and measurement and evaluation before class ($\overline{X}$=4.43), teachers creating opportunities for students to collaborate in forming knowledge in and outside of the classroom ($\overline{X}$=4.29), and teachers assigning students activities to support students' understanding by performing actions as individuals and in groups ($\overline{X}$=4.24), respectively.

2.3 Managing learning environments

The results of EFA showed that the factor loadings (β) of all factors were 0.515 to 0.702 showing that all factors were appropriate for analyzing the smart teaching practices of junior higher school teachers in the managing learning environments aspect. The highest factor loading was of teachers creating a learning environment that encourages students to share their ideas and listen to others' opinions both in their on-site and online classrooms (β=0.702). The teachers created a learning environment that encouraged students' collaborative learning in various styles (β=0.674). The teachers created a physical environment and learning atmosphere that encouraged students to search for knowledge on their own from different resources and the Internet (β=0.666). The teachers created a physical environment and learning atmosphere that encouraged students' collaborative learning (β=0.658). The teachers created a learning environment that supported students to improve their thinking skills and solve problems that were based on real-life and led to the utilization (β=0.658). The teachers supported students to learn from their communities and integrated knowledge from the community into their classrooms (β=0.650). The teachers supported

students to learn from the knowledgeable people in their communities and created a learning community between learners and communities on-site and/or in an online classroom (ß=0.622). The teachers integrated digital literacy development skills in their classrooms (ß=0.602). The teachers managed their classroom environment to be integrated with technology and learning supportive tools as a smart classroom or a smart classroom-like environment (ß=0.583). Finally, the teachers supported students to set their learning goals based on the learner-centered approach (ß=0.515).

The levels of applying the smart teaching practices in the managing learning environments aspect were at high levels in all processes. The highest level was of teachers creating a physical environment and learning atmosphere that encourages students' collaborative learning ($\overline{X}$ =4.21), teachers supporting students to set their learning goals based on the learner-centered approach ($\overline{X}$ =4.17), and teachers creating a learning environment that encourages students' collaborative learning in various styles ($\overline{X}$ =4.16), respectively.

2.3 Measurement and evaluation of learning outcomes

The results of EFA showed that the factor loadings (ß) of all factors were 0.515 to 0.734 showing that all factors were appropriate for analyzing the smart teaching practices of junior higher school teachers in the measurement and evaluation of learning outcomes aspect. The highest factor loading was of teachers using digital technology and computer applications for creating measurement or evaluation tools such as Kahoot or Google Form (ß=0.734). The teachers used digital technology and computer applications for recording learning results and monitoring learners' behaviors in individuals and in groups (ß=0.719). The teachers set measurement and evaluation topics that were consistent with the objectives, contents, and real situations (ß=0.690). The teachers used summative evaluation after activities to check learners' learning outcomes (ß=0.661). The teachers used various types of measurement and evaluation that were consistent with the expected learning outcomes for individuals and in groups evaluation (ß=0.652). The teachers used self-evaluation to let students evaluate their understanding of the lessons and evaluate their skills learned from each lesson (ß=0.651). The teachers let students evaluate the teacher's efficiency in terms of knowledge, teaching, and the teacher's characteristics of their responsible subjects (ß=0.648). The teacher used formative evaluation during classroom activities to check whether learners had developed their competency based on the objectives of the activities (ß=0.630). The teachers used measurement and evaluation before their teaching to check students' general knowledge and their readiness (ß=0.575). Finally, the teachers used diagnostic evaluation to figure out learners' problems and solve them (ß=0.515).

The levels of applying the smart teaching practices in the measurement and evaluation of learning outcomes aspect were at high levels in all processes. The highest level was of teachers using various types of measurement and evaluation that are consistent with the expected learning

outcomes for individuals and in groups evaluation ($\overline{X}$ =4.26), teachers setting measurement and evaluation topics that are consistent with the objectives, contents, and real situations ($\overline{X}$ =4.25), and teachers using summative evaluation after activities to check learners' learning outcomes ($\overline{X}$ =4.22), respectively.

DISCUSSION

Smart Teaching Practices is a new teaching concept that emphasizes developing learners' competency in which the teachers need to understand contents, teaching methods, learning activities, and measurement and evaluation (Saunders, Oradini, & Saunders, 2016, p. 100; Tuamsuk, 2020, p. 2). Moreover, in this digital era when education and learning technology are advanced, teachers have to quickly change their teaching styles. The results of this study indicated that teachers have brought technology into their classrooms and made it consistent with their students' behaviors in this digital era. The learning environment has been changed to focus on encouraging learners to express ideas and listen to others on both on-site and online platforms. Digital technology and computer application have become tools for measurement and evaluation (Alfoudari, Durugbo, & Aldhmour, 2021, p. 2). Therefore, school administrators must pay attention to the development of teachers in terms of skills in technology and must support basic technology that is needed for smart teaching practices including the Internet, learning management programs, and other learning activities (Akhrif, Benfares, & Hmina, 2020, p. 713)

This is also the policy and the emphasized point to promote the quality of education of the Ministry of Education of Thailand 2022 and 2023 that competency-based education should be integrated into the learning management and measurement and evaluation process and brought to classrooms (Ministry of Education, Thailand, 2022, online). The findings of this study showed that teachers paid attention to defining learning outcomes of their responsible subjects based on competency development – knowledge, skills, and individual competency. In addition, they created lesson plans that were consistent with the defined expected learning outcomes by setting objectives, topics, activities, and measurement and evaluation methods. With these practices, teachers can design the appropriate and systematic instructions and activities (Cheung, Phusavat, & Yang, 2021, p. 4)

New teaching techniques apart from lectures are needed to make smart teaching successful. Therefore, teachers should have several teaching styles that focus on active learning to encourage learners through the thinking process, collaborative learning, self-learning, exchanging knowledge, and solving problems with continuously developing skills and knowledge (Daouk, Bahous, & Bacha, 2016, pp. 362-364). In this case, KKU Smart Learning always develops teachers to be able to apply teaching techniques that are consistent with their subjects and learners' (junior higher school students

aged 13-15 years old) learning styles. To clarify, English subjects adopted and adapted task-based learning and communicative language learning approaches. Science subjects used an inquiry-based learning approach to let learners understand scientific phenomena by learning from the virtual lab that was related to real-life situations. Then, learners can analyze the causes and effects of the situations by themselves. Mathematics subjects emphasized problem-based and experienced-based learning approaches. A mathematics application was developed and used in classrooms. The application related mathematics problems with real-life situations that learners can face in their everyday life (Tuamsuk, 2020, p. 2). The concept of KKU Smart Learning was similar to the concept of Shieh, Liao, and Hu (2013, p. 410) described that learning activities should be related to the contents and nature of the subjects together with the integration to real-life situations or learners' experiences. Thus, learners should have a chance to initially think and search for their knowledge, then, teachers are responsible for describing and linking those ideas to the accurate and clearer understanding.

The development of teachers should support teachers to have the ability in smart teaching that is the new teaching method. It is appropriate with this digital environment, especially during the Covid-19 pandemic that inevitably forces us to do online teaching. The recommendation of this study, thus, aims to the Ministry of Education, school administrators, and university that is a place for producing new teachers for our society to emphasize teachers' development in the new teaching methods that focus on learners' competency. We also recommend that computer and digital technology are needed in teaching and learning with the activities that are in various styles and consistent with contents and learners' behaviors. The most significant key is teacher development as it is the initial factor that leads to the promotion of the quality of Thai education.

SUGGESTIONS

The finding suggest the need for deeper development of teacher skills will be achieving for junior-high schools who are able to build their knowledge, skill, ability and digital competencies for smart teaching.

ACKNOWLEDGEMENTS

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