Developing a Model to Enhance Junior High School Teacher 21st Century Learning Management Competencies

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Abstract

This study pursues a comprehensive tripartite agenda: firstly, to investigate the essential requisites for formulating a model geared towards augmenting teachers' 21st century learning management competencies; secondly, to design a tailored model aligned with these competencies; and thirdly, to scrutinize the tangible impact of model implementation. Employing a multi-phased approach involving meticulous need analysis, model development, and real-world implementation, this study navigated a dynamic educational landscape. Phase 1 involved 353 participants, collectively shaping the foundation for subsequent phases. Phase 2 harnessed the expertise of five seasoned educators and scholars to collaboratively refine and assess the model. Phase 3 expanded the scope to encompass 24 junior high school teachers and 36 educational stakeholders, further validating the model's utility. The outcomes highlight a model encompassing curriculum development, learner-centered active learning strategies, media and technology integration, authentic learning assessment, and conducting research for learner development. This comprehensive model was fashioned as a dynamic workshop, integrating face-to-face training, coaching training, and online modules, thereby catering to diverse learning preferences. Remarkably, the model's implementation elicited substantial benefits: significant enhancements were observed in teachers' 21st century learning management skills, while students' 21st century skills also experienced discernible progress. Notably, the model's overall quality, rigorously evaluated through the $CIPP_{IEST}$ model, reaffirms its excellence and potential for sustainable educational advancement.

Keywords: model development, learning management competencies, 21st century skills

1. Introduction

In the rapidly evolving landscape of education in the 21st century, the role of teachers has transformed significantly, necessitating a comprehensive set of skills and competencies to effectively navigate the diverse challenges of modern classrooms (Erdem, 2019; Mandal, 2018). At the heart of this paradigm shift lies the imperative for teachers to possess robust learning management competencies. Learning management competencies encompass a multifaceted array of abilities that empower educators to orchestrate impactful learning experiences for their students. Central to these competencies is the adeptness in crafting and implementing well-structured educational endeavors (Nessipbayeva, 2012). This entails the strategic planning and seamless design of classroom activities that cater to the dynamic needs of a diverse student body. Moreover, it entails the application of innovative instructional techniques that resonate with the digital and interactive nature of contemporary learning environments. An equally vital aspect is the proficiency in conducting fair and systematic assessments, gauging the efficacy of instruction and fostering students' growth. This amalgamation of skills harmonizes to form the bedrock of a teacher's capacity to navigate the intricate interplay between pedagogy, technology, and assessment, ensuring the cultivation of an enriched and holistic educational experience (Kakkeaw & Sitthisua, 2018).

In the realm of education, the 21st century has emerged as a pivotal era marked by rapid technological advancements and an increasingly interconnected global landscape. This juncture has brought forth an imperative to reconfigure educational paradigms, ensuring that they remain aligned with the evolving needs and demands of society (Tarragó & Wilson, 2010). In this pursuit, the Thai education system has embraced a holistic framework, encapsulated within the 3R8C model. This model, devised by the Ministry of Education,

encapsulates the essence of modern educational priorities, accentuating the cultivation of reading and writing proficiency, arithmetic skills, critical thinking and problem solving abilities, creativity and innovation aptitude, cross-cultural understanding, collaboration, teamwork, and leadership capabilities, communication, information, and media literacy, computing and it literacy, and career and learning skills, all underscored by an ethos of compassion (The Ministry of Education, 2015). This comprehensive framework has not only become the cornerstone of student development but has also extended its influence on the professional growth of educators. As a result, the acquisition of these competencies by junior high school teachers is not only pivotal for their own enrichment but also instrumental in nurturing the potential of their students, thereby fostering a harmonious alignment between education and the dynamic needs of the 21st century society.

Amidst the backdrop of the 3R8C model's comprehensive vision for education, it becomes evident that a multitude of expectations are placed upon students to cultivate a diverse array of competencies. Simultaneously, the role of teachers transcends the conventional boundaries of the classroom, encompassing the responsibility to not only impart knowledge but also to nurture holistic student development through supplementary activities. However, the Thai education landscape has not been without its share of scrutiny. Criticisms have highlighted its perceived inequities (Prasartpornsirichoke & Takahashi, 2013), teacher-centric approach (Noom-ura, 2013), and top-down educational policy (Pongsudhirak, 2020). These critiques raise valid concerns regarding the seamless integration of 21st century skills within the existing educational framework. The challenge of instilling skills like critical thinking, collaboration, and creativity within a system criticized for its rigidity and inequality is unmistakable. Addressing this challenge necessitates innovative strategies that empower educators to transform their teaching practices, adapting them to encompass modern pedagogies. An urgent demand emerges for pioneering approaches that can bridge the gap between the current state of education and the aspirations embedded in the 3R8C model. These approaches must empower teachers to enhance their learning management competencies, enabling them to effectively nurture the growth of 21st century skills within their students, even in the face of systemic constraints.

The pedagogical strategy of employing targeted models to teach specific skills has garnered recognition for its efficacy in instructional contexts (Anchunda, 2021; Chimplee, Jiraro, & Lila, 2017). Among these approaches, the development of tailored models emerges as particularly promising. Such model development embraces the principles of Research and Development (R&D), which involves a meticulous process encompassing need analysis and subsequent model creation, aimed at addressing contextual challenges comprehensively (Erfani, 2019; Kainulainen, 2014). Within this framework, the present study directs its focus toward the construction of a model utilizing the research and development paradigm. The primary objective of this endeavor revolves around conducting an in-depth analysis of the requirements essential for cultivating an effective model designed to enhance teachers' learning management competencies pertinent to the cultivation of 21st century skills. The need analysis phase stands as a cornerstone, facilitating the identification of specific contextual nuances and challenges. These insights serve as the bedrock for constructing a robust model tailored to tackle the identified needs. By adopting a systematic approach, this model is subsequently implemented to facilitate the development of teachers' learning management competencies vis-à-vis the cultivation of 21st century skills. In essence, the study amalgamates theoretical underpinnings with empirical insights, offering a holistic framework to empower educators in their pursuit of fostering modern skills within an ever-evolving educational landscape.

2. Literature Review

2.1 21st Century Skills

The 21st century has ushered in a paradigm shift in the educational landscape, emphasizing the cultivation of skills that transcend traditional academic knowledge. This transformation has spurred extensive discussions and research within educational circles, with scholars and practitioners alike exploring the realm of 21st century skills (Delaney, 2016). While various perspectives and models have emerged on how to effectively integrate these skills into education, the present study directs its focus toward a particular model that holds prominence within the Thai educational context: the 3R8C model. This model, formulated by the Ministry of Education, encompasses a comprehensive framework that encapsulates the multifaceted dimensions of 21st century skills development. The details of each component can be seen below.

2.1.1 Hard Skills (3Rs)

The foundational pillars of the 3R8C model, Reading, (w)Riting, and (A)Rithmetic, encapsulate essential hard skills that have traditionally been cornerstones of education systems across the globe. In the context of Thai education, these skills hold a particularly significant role, positioned as indispensable prerequisites for a well-rounded education. The mastery of Reading equips students with the ability to comprehend and analyze

information from diverse sources, fostering the development of critical thinking and analytical acumen. Meanwhile, the skill of (w)Riting empowers students to express themselves coherently and effectively, honing communication abilities that are essential for both academic pursuits and future professional endeavors. (A)Rithmetic, encompassing mathematical proficiency, nurtures logical reasoning and problem-solving skills, fostering a quantitative aptitude that is fundamental for a wide array of fields. Collectively, these first three skills not only serve as conduits for knowledge acquisition but also lay the groundwork for the development of cognitive capacities that extend beyond the classroom, enriching students' intellectual growth and augmenting their overall capacity to engage with the complexities of the modern world.

2.1.2 Soft Skills (8Cs)

Complementing the fundamental hard skills, the 3R8C model introduces a constellation of soft skills commonly referred to as the 8Cs—critical thinking and problem solving, creativity and innovation, cross-cultural understanding, collaboration, teamwork and leadership, communication, information and media literacy, computing and IT literacy, career and learning skills, and compassion. These skills collectively constitute the bedrock of a holistic education, transcending the traditional confines of the classroom to encompass the broader spectrum of students' lives. Critical thinking and problem-solving abilities equip students with the intellectual agility to analyze complex scenarios, devise innovative solutions, and make informed decisions. Creativity and innovation, often considered the cornerstone of progress, enable students to approach challenges with fresh perspectives, fostering a mindset primed for adaptation and originality. Cross-cultural understanding nurtures a global perspective, enhancing empathy and the capacity to engage harmoniously in an increasingly interconnected world.

Collaboration, teamwork, and leadership skills, essential in both academic and professional contexts, empower students to work synergistically, navigating the dynamics of diverse teams and assuming leadership roles when necessary. Proficiency in communication, information, and media literacy enhances students' ability to convey ideas effectively, interpret information critically, and navigate the information-rich digital landscape adeptly. Computing and IT literacy, fundamental in the digital age, empower students to harness technology as a tool for innovation and efficiency.

Career and learning skills enable students to chart their educational and vocational trajectories effectively, promoting lifelong learning and adaptability. Compassion, a cornerstone of emotional intelligence, nurtures empathy and ethical consciousness, driving students to contribute positively to their communities and society at large. Collectively, these 8Cs instill qualities that not only enrich academic experiences but also resonate through students' personal lives and future careers, equipping them with a multidimensional toolkit for success in the complex and interconnected 21st century landscape.

2.2 Learning Management Competencies

Learning management competencies encompass a multifaceted array of skills and abilities that educators must master to navigate the dynamic landscape of modern education effectively (Briggs, 1991; Gagne et al., 2004; Smith, 2004). One key facet is curriculum development and learning management design, which involves the strategic crafting of educational content and the orchestration of learning experiences that resonate with the needs of the 21st century learner. Moreover, the ability to handle learner-centric active learning activities adds another dimension to learning management competencies. In a rapidly changing world, educators must shift from being mere transmitters of knowledge to becoming facilitators of active engagement. This necessitates the ability to design and execute activities that promote critical thinking, collaborative problem-solving, and creativity among students (Munna & Kalam, 2021). In the realm of technology and innovation, educators must be well-versed in Media, Innovation, technology, and learning resource development. This involves harnessing various digital tools and resources to create dynamic learning environments that transcend traditional classroom boundaries. Proficiency in leveraging technology for interactive and engaging content delivery, fostering digital literacy, and promoting innovative pedagogies becomes indispensable in preparing students for the digital era (Belland, 2019). Furthermore, assessment ability stands as a cornerstone of these competencies. Modern educators are tasked with assessing student learning in ways that mirror real-world scenarios, going beyond rote memorization to evaluate application and critical analysis. This requires designing assessment methods that gauge higher-order thinking skills and holistic understanding, providing a comprehensive picture of student achievement. The learning management competencies also encompass conducting developing research for learner development. Educators must be equipped with the skills to analyze, synthesize, and apply educational research to inform and refine their teaching practices (Swerdlow, 2013). This involves a commitment to ongoing professional development and a willingness to adapt instructional strategies based on evidence-based findings.

Incorporating these diverse competencies into their pedagogical approach empowers educators to effectively address the multifaceted challenges of contemporary education. By honing these skills, teachers not only enrich their own professional growth but also cultivate an enriched and holistic educational experience for their students, nurturing the vital 21st century skills required for success in the modern world.

2.3 Developmental Model for Specific Needs

The concept of a developmental model for specific needs has gained widespread recognition as a method that yields solutions intricately aligned with contextual requirements (Anchunda, 2021; Chimplee et al., 2017). According to Kilfoil (2008), the approach holds value due to its dynamic nature, which allows for tailored solutions to emerge in response to unique challenges. This model unfolds through a systematic process that encompasses several stages. The initial phase involves an in-depth need Study, during which the distinct requirements and intricacies of the situation are scrutinized. This study serves as the foundation upon which subsequent actions are built, ensuring that the model's development is firmly rooted in addressing actual demands. Expert Evaluation constitutes the subsequent step, wherein knowledgeable individuals assess the proposed model's feasibility, effectiveness, and relevance. These evaluations draw upon the expertise of professionals in the field, validating the model's potential to address specific needs successfully. Subsequent to the evaluation, necessary adjustments are made based on the feedback received. This iterative process ensures that the model is refined and fine-tuned to optimize its alignment with contextual intricacies. Ultimately, the implementation phase comes into play, during which the meticulously developed model is put into action.

2.4 Previous Studies

Numerous scholars have provided strong support for the proposition that the development of models represents a viable pathway for augmenting the professional development of teachers (e.g., Anchunda, 2021; Çetin & Bayrakc, 2017; Chimplee, Jiraro, & Lila, 2017; García-Rico, Martínez-Muñoz, Santos-Pastor, & Chiva-Bartoll, 2021; Ravhuhali, Mashau, Kutame, & Mutshaeni, 2015). Anchunda (2021) introduced a teacher development approach that focuses on coaching and Professional Learning Communities (PLCs) to increase the teaching skills of foreign educators in the Thai environment. This model has been influential in paving the road for empowering these educators. In a similar vein, the study conducted by Çetin and Bayrakc (2017) explored various approaches of teacher professional development that have a positive impact on enhancing teaching and learning practices in educational settings. Chimplee et al. (2017) conducted a study aimed at developing a model that enhances teachers' research competency through the use of participatory action research. The researchers emphasized the potential of this strategy in improving teachers' research skills and promoting their overall professional development. In a recent study conducted by García-Rico et al. (2021), an investigation was carried out on a pedagogical model that is based on service-learning and specifically designed for physical education teacher education. The study aimed to shed light on the effectiveness of novel pedagogies that are in line with current educational requirements. Ravhuhali et al. (2015) conducted a comprehensive examination of different models pertaining to professional development for teachers, with the aim of enhancing teaching and learning outcomes. The research conducted by the authors provided valuable insights into the various tactics that can effectively enhance teaching efficacy and yield beneficial outcomes. As the conversation progresses, it becomes clear that focusing on certain aspects of teacher development through the creation of models is effective, indicating a proactive and outcome-oriented strategy. This study seeks to enhance the credibility of model-based teacher development by contributing to the ongoing dialogue in the area of study. The purposes of the study were 1) to study necessities of developing a model for enhancing teachers' 21st century learning management competencies, 2) to develop a model for enhancing teachers' 21st century learning management competencies, and 3) to study the effect of the model implementation.

3. Methodology

The investigation was formulated employing the research and development (R&D) methodology. The study consists of three distinct phases, with comprehensive explanations of the research methods employed during each respective phase provided below.

3.1 Phase 1: Need Analysis on the Necessities of Mode Development

The initial phase of the study focuses on examining the requirements for enhancing the 21st century teaching skills of schoolteachers. The participant pool comprised 353 stakeholders involved in model development, including 2 educational area administrators, 12 school administrators, 12 school deputy administrators, 4 inspectors, and 323 junior high school teachers. These individuals were chosen from the larger population of 2993 educational personnel in Thailand's Yasothon and Srisaket provinces.

To determine the sample size, the Krejcie and Morgan (1970) principles were employed, ensuring a 95% reliability level. Stratified sampling techniques were used for participant selection. The primary instrument employed was a questionnaire designed to explore the needs for enhancing schoolteachers' 21st century teaching skills. This questionnaire consisted of 25 items covering areas such as curriculum development, learner-centered active learning strategies, media and technology integration, innovation, authentic learning assessment, and conducting research for learner development. Each area had 5 items.

The significance of each aspect's requirements was established using the modified Priority Needs Index (PNI) (Wiratchai, 1999; Wiratchai & Wongwanich, 1998). This involved calculating the difference between the reported necessity and the current status and then dividing this difference by the current status. This is to set priority of topics instructed throughout the process of the model.

3.2 Phase 2: Model Development

The second phase of the study is aimed at constructing a model based on the findings from phase 1. A panel of 5 experts specializing in educational management, including educational management officers, school administrators, and scholars, was tasked with assessing the model's content. Their role was to offer feedback, recommendations, and suggestions for refinement. The tools utilized for this phase encompassed a preliminary rendition of the model designed to enhance schoolteachers' 21st century teaching skills, an evaluation form for the model, and a Multi Attribute Consensus Reaching (MACR) approach for evaluating the model's effectiveness.

3.3 Model Implementation

In the third and final phase of the study, the implemented model takes center stage. This phase is dedicated to gauging the model's effectiveness across several key assessment dimensions. Primarily, the evaluation encompasses the enhancement of schoolteachers' 21st century teaching competencies, the improvement of students' 21st century skills (specifically 3R8C skills), and an overall holistic assessment through the CIPPIEST Model (Stufflebeam & Shinkfield, 2007).

The participants engaged in the model's application included 24 teachers from three different schools. Additionally, the evaluation of the model's impact using the CIPP$_{IEST}$ Model involved a total of 36 individuals. This broader group consisted of the initial 24 teachers who participated in the model, along with six academic affairs representatives from the three schools, two school administrators, and four educational inspectors.

The model's educational content, covering topics such as curriculum development, learner-centered active learning strategies, media and technology integration, innovation, authentic learning assessment, and conducting research for learner development, was conveyed to the 24 participants through interactive approaches such as face-to-face interactions, coaching sessions, and online modules.

Furthermore, evaluation forms were utilized to measure the progress achieved:

A self-assessment questionnaire employing a 5-point Likert scale was administered to the schoolteachers, allowing them to evaluate their own progress in 21st century teaching competencies.

An evaluation form was distributed for the assessment of students' 21st century skills. The 24 participating teachers self-assessed their students' development in 3R8C skills, offering insights into the efficacy of the model's impact on their classrooms.

The CIPP$_{IEST}$ Model was employed to holistically evaluate the entire model implementation. This comprehensive evaluation framework encompassed context evaluation, input evaluation, process evaluation, product evaluation, impact evaluation, effectiveness evaluation, sustainability evaluation, and transportability evaluation.

4. Results

4.1 Necessities of the Model Development

It was found that respondents of the questionnaire totaled 353 individuals, with the majority being female, accounting for 54.11%. Currently, 91.50% hold the position of teachers. Those aged between 30 to 39 years old represent 41.36%. Regarding educational qualifications, 62.04% possess a master's degree. Furthermore, 35.98% have work experience in the education field ranging from 20 to 29 years. Table 1 shows the modified Priority Needs Index (PNI) of the model development.

Table 1. Priority Needs Index (PNI) of the model development

Necessities of the 21st century learning management competency development	)I :Important(			)D :Degree of success(			PNI modified	Priority
	x̄	S.D.	Degree	X̄	S.D.	Degree		
Curriculum Development	4.67	0.63	Highest	4.46	0.70	High	0.04	5
Learner-Centered Active Learning Strategies	4.65	0.61	Highest	4.36	0.68	High	0.06	4
Media and Technology Integration	4.79	0.45	Highest	4.38	0.57	High	0.09	2
Authentic Learning Assessment	4.74	0.57	Highest	4.37	0.65	High	008.	3
Conducting Research for Learner Development	4.84	0.44	Highest	4.38	0.56	High	0.10	1
Overall	4.74	0.5 4	Highest	4.39	0.63	High	0.07	

The assessment results demonstrate a hierarchy in the priority of 21st century learning management competencies, with the following ranking from the least to the most prioritized: Conducting Research for Learner Development (PNImodified = 0.1), Media And Technology Integration (PNImodified = 0.09), Authentic Learning Assessment (PNImodified = 0.08), Learner-Centered Active Learning Strategies (PNImodified = 0.06), and Curriculum Development (PNImodified = 0.04). This ranking highlights the disparities between the current state and the required developmental focus. As a direct response to these priorities, the model was executed with meticulous consideration of this sequence, ensuring a concentrated effort on addressing the identified needs comprehensively.

4.2 The Development of the Model

The model's formulation was informed by the insights garnered from the initial phase of the study. Its development was facilitated through a focused group discussion, employing the Multi Attribute Consensus Reaching (MACR) approach. The conceptualization of the model encompassed several vital domains, notably curriculum development, learner-centered active learning strategies, media and technology integration, authentic learning assessment, and conducting research for learner development.

The structural composition of the model involved several integral components. These components encompassed a comprehensive background and rationale, articulating the model's context and justification. Furthermore, the model laid out its guiding principles, elucidated its overarching objectives, delineated participant development activities, and outlined the evaluation and assessment processes.

Of particular significance were the participant development activities, which were meticulously integrated into the model. These activities encompassed a triad of approaches: face-to-face training, coaching training, and online training. These modes of engagement were orchestrated to ensure a well-rounded and effective capacity-building process for the participants, thus contributing to the holistic efficacy of the developed model.

The assessment results of the suitability of the drafted model indicate the highest level of suitability overall (x̄ = 4.58, S.D = 0.52). When considered in order of appropriateness, the top three rankings are as follows: Firstly, the aspect of utility ranks as the most suitable (x̄ = 4.70, S.D = 0.49). Following that is the aspect of accuracy, which also ranks as highly suitable (x̄ = 4.57, S.D = 0.51). Lastly, the aspect of appropriateness ranks as highly suitable (x̄ = 4.55, S.D = 0.53). On the other hand, the aspect with the lowest average score is feasibility, which falls within a high level of suitability (x̄ = 4.48, S.D = 0.53).

4.3 The Implementation Process of the Model

Table 2. 21st century learning management competencies of teacher participants

21st century learning management competencies	Face to face Training			Coaching Training			) Online Training(		
	x̄	S.D.	Level	x̄	S.D.	Level	x̄	S.D.	Level
Curriculum Development	4.58	0.42	Very high	4.84	0.35	Very high	4.24	0.61	High
Learner-Centered Active Learning Strategies	4.33	0.58	High	4.81	0.40	Very high	4.66	0.41	Very high
Media and Technology Integration	4.34	0.57	High	4.75	0.37	Very high	4.81	0.38	Very high
Authentic Learning Assessment	4.74	0.37	Very high	4.78	0.34	Very high	4.34	0.62	High
Conducting Research for Learner Development	4.34	0.64	High	4.79	0.36	Very high	4.78	0.37	Very high
Average	4.47	0.52	High	4.79	0.36	Very high	4.57	0.48	Very high
Overall							4.61	0.49	Very high

The research findings reveal that the overall competency level of schoolteachers joining the model in terms of learning management in the 21st century is at a very high level ($\bar{x}$ = 4.61, S.D = .(0.49The highest quality training method is coaching training, which ranks as the most effective ($\bar{x}$ = 4.79, S.D = .(0.36Following that is hands-on/practical training (Face to face Training), which is at a high level ($\bar{x}$ = 4.47, S.D = .(0.52Lastly, online training using electronic media (Online Training) ranks as the most effective ($\bar{x}$ = 4.57, S.D = .(0.48

Table 3. The implementation of the model on students' 21st century skills

21st century learning management competencies	Face to face Training			Coaching Training			Online Training		
	$\bar{x}$	S.D.	Level	$\bar{x}$	S.D.	Level	$\bar{x}$	S.D.	Level
3Rs									
Reading, (w)Riting, and (a)Rithmetic	4.61	0.52	Very high	4.66	0.52	Very high	4.59	0.52	Very high
8Cs									
Critical Thinking and Problem Solving	4.61	0.49	Very high	4.66	0.54	Very high	4.58	0.46	Very high
Creativity and Innovation	4.58	0.52	Very high	4.61	0.54	Very high	4.73	0.66	Very high
Cross-cultural Understanding	4.75	0.52	Very high	4.69	0.56	Very high	4.65	0.53	Very high
Collaboration teamwork and leadership	4.64	0.52	Very high	4.68	0.56	Very high	4.52	0.40	Very high
Communications information and media literacy	4.56	0.44	Very high	4.73	0.61	Very high	4.65	0.53	Very high
Computing and ICT literacy	4.59	0.46	Very high	4.66	0.53	Very high	4.71	0.58	Very high
Career and learning skills	4.64	0.51	Very high	4.62	0.50	Very high	4.55	0.42	Very high
Compassion	4.72	0.59	Very high	4.71	0.59	Very high	4.68	0.56	Very high
Average	4.64	0.51	Very high	4.67	0.55	Very high	4.63	0.52	Very high
Overall							**4.65**	**0.52**	**Very high**

The research findings indicate that the 21st Century skills (3R8C) of school students in the teacher participant classes are at a very high level ($\bar{x}$ = 4.65, S.D = (0.52 overall .When considering the different aspects, it is observed that skills acquired from teachers who underwent coaching training are at the highest level ($\bar{x}$ = 4.67, S.D = .(0.55Following closely are skills acquired from teachers who participated in hands-on/practical training (Face to face Training), which also rank at the highest level ($\bar{x}$ = 4.64, S.D = .(0.51Additionally, skills acquired from teachers who underwent online training using electronic media (Online Training) are at the highest level as well ($\bar{x}$ = 4.63, S.D = .(0.52

Table 4. CIPP$_{IEST}$ evaluation on the model

No.	CIPP$_{IEST}$ Model evaluation	$\bar{x}$	S.D.	Level
.1	Context evaluation	4.54	0.56	Very high
.2	Input evaluation	4.42	0.67	High
.3	Process evaluation	4.63	0.55	Very high
.4	Product evaluation	4.72	0.46	Very high
.5	Impact evaluation	4.55	0.61	Very high
.6	Effectiveness evaluation	4.56	0.67	Very high
.7	Sustainability evaluation	4.48	0.63	High
.8	Transportability evaluation	4.45	0.67	High
	Overall	4.55	0.60	Very high

The research outcomes reveal that the overall assessment indicates a very high quality of the model following the CIPP$_{IEST}$ model ($\bar{x}$ = 4.55, S.D. = 0.60). The top three aspects with the highest quality levels are as follows: Firstly, the aspect of product evaluation is at a very high level ($\bar{x}$ = 4.72, S.D = 0.46). Following that is the aspect of process evaluation, which is also at a very highest level ($\bar{x}$ = 4.63, S.D = 0.55). Additionally, the aspect of effectiveness evaluation ranks as a very high ($\bar{x}$ = 4.56, S.D = 0.67). On the other hand, the aspect with the lowest quality level is input evaluation, which falls within a high level ($\bar{x}$ = 4.42, S.D = 0.67).

5. Discussion

The findings indicate that the essential components for enhancing 21st century learning management competencies encompass curriculum development, learner-centered active learning strategies, media and technology integration, authentic learning assessment, and conducting research for learner development. This

observation is congruent with prior research by Mandal (2018) and Nessipbayeva (2012), who also identified similar attributes in the skills of 21st century educators.

In detail, competencies in curriculum development, learner-centered active learning strategies, media and technology integration, authentic learning assessment, and conducting research for learner development collectively shape a holistic approach to nurturing students in the 21st century. Skillful curriculum development ensures learning materials are pertinent and applicable, fostering critical thinking and practical skills. Proficiency in learner-centered strategies promotes engagement, collaboration, and independent learning. Integrating media and technology cultivates digital literacy and adaptability. Authentic assessment measures real-world application, fostering problem-solving and creativity. Finally, conducting research refines teaching practices, enhancing the overall educational experience. These competencies synergistically equip students with adaptability, critical reasoning, digital fluency, practical proficiency, and self-driven learning capabilities crucial for thriving in our rapidly evolving world.

The study underscores the significance of model development as a valuable tool for advancing educational progress, benefiting both teachers' competencies and students' acquisition of 21st century skills. The research outcomes align with prior investigations conducted by Anchunda (2021), Çetin and Bayrakc (2017), Chimplee, Jiraro and Lila (2017), García-Rico et al. (2021), and Ravhuhali et al. (2015), who similarly recognized the advantages of model development in education enhancement.

In the context of this study, model development functions as a tailored solution, addressing specific needs and necessities within a particular educational environment. The process involves a meticulous assessment of the current state of educational competencies and skills, identifying areas that require enhancement. From this assessment, content is meticulously formulated, aligning with the unique demands of the context. This approach ensures that the developed model directly caters to the requirements of teachers and students in their pursuit of 21st century competencies. By homing in on context-specific needs, the model becomes a potent instrument for driving targeted and effective educational development.

6. Conclusion

In conclusion, this study delves into the creation of a model aimed at enhancing 21st century learning management competencies among junior high school teachers. This multifaceted process encompasses need analysis, model development, and model implementation. The outcomes not only shed light on the components that warrant inclusion within the model, but also offer insights into the optimal instructional approaches for the model's content, and subsequently, the tangible impacts of its implementation.

As pedagogical and academic recommendations, educators are encouraged to incorporate the model's insights into their instructional practices, fostering a forward-looking learning environment that nurtures both teachers' competencies and students' growth in alignment with the demands of the 21st century. Furthermore, institutions and educational authorities can utilize the study's outcomes to inform policy decisions and professional development initiatives that promote the integration of 21st century teaching methodologies across junior high school curricula.

However, this study is not without its limitations. The assessment of the model's effects primarily relies on self-evaluation, which may introduce subjectivity and potential biases. While self-evaluation is a fundamental aspect, given the scale of the study, it is worth acknowledging that incorporating additional evaluation methods could enhance the comprehensiveness of the findings. Future research endeavors could consider supplementing self-evaluation with objective measures, such as standardized tests or performance assessments, to further gauge the extent to which teachers are developing their 21st century competencies. This holistic approach would provide a more well-rounded understanding of the model's impact and contribute to a more robust evaluation of its effectiveness in educational contexts.

Authors' contributions

Not applicable.

Competing interests

Not applicable.

Informed consent

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Data sharing statement

No additional data are available.

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