

Teacher Competence and 21st Century Skills in Transformation Schools 2025 (TS25)

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Abstract The purpose of this study is to identify the relationship between teacher competence and 21st century skills. Besides, the study also examines the influence of each dimension on teacher competence that contributes to predictive factors in 21st century teachers' skills in teaching. A total of 242 secondary school teachers TS25 Cohort 1 North Zone of Peninsular Malaysia selected as study participants. The study also used quantitative approaches involving systematic random sampling. There are two instruments used in the study which are variables of teacher competence based on the Malaysian Teacher Standards by the Ministry of Education Malaysia (2009) and 21st century skills based on the 21st Century Knowledge and Skills in Teacher Educator framework by Partnership For 21st Century Skills (2010). The analysis of the study shows that there is a robust and positive relationship between professional competence and 21st century skills among teachers. The findings also predict that personal characteristics, pedagogy, professional, information and communication technology (ICT), as well as school management and development, are significant contributors to 21st century skills. The findings also show that the dimensions of teacher competence have the potential to help further develop the potential of teachers in line with 21st century learning (PAK-21) concepts. The 21st century skills are the heartbeat for teachers to improve the quality of teaching in line with current educational developments.

Keywords Teacher Competence, 21st Century Skills, Transformation Schools, Pedagogy, 21st Learning Skills

1. Introduction

In realizing the best educational opportunities, there are various ways to enhance the recruitment, training, and re-exposure of teachers to make them a Malaysian citizen

who is competitive in the global market. Today, teachers not only need to ensure that their academic achievement is improving but at the same time they are developing a workforce based on 21st century skills and a holistic personality to meet the latest economic challenges [1]. This intention reflected in the 2013-2025 Malaysian Education Development Plan (PPPM) report. In this regard, the Ministry of Education Malaysia (MOE) launched the 21st century learning method initiative as a pilot plan in 2014 and fully implemented in 2015 [2].

The development of science and technology took place very fast in the era of industrial revolution 4.0. This situation requires humans to work on a complex framework of thinking and communication skills. Thus, the [3] has outlined four critical 21st century skills which include learning and innovation skills, life and career skills, information skills, media and technology and necessary literacy skills. Teaching practices based on 21st century skills elements have begun to be emphasized by educational institutions to meet the demands of the workforce in the market [4]. This phenomenon stems from the urges and complaints of business organizations that question whether graduates produced by educational institutions are unable to compete in the global market, either technical or soft skills. Excellent academic achievement or a degree certificate will not guarantee accessible job opportunities [5].

At the latest, organizations need a versatile package of 21st century skills such as thinking skills, interpersonal relationships, the ability to apply the latest systems and technologies as well as personal qualities [6]. Teamwork, ethics, flexibility, initiative and motivation are additional features that an employee needs in an organization [7]. Educational institutions such as schools are the best organization in developing new skills for students to meet market demands. As such, teachers' competencies strongly emphasized in translating 21st century skills to students through a more systematic teaching process.

1.1. Problem Statements

In Malaysia, various efforts have been made by the MOE to produce quality teachers in line with the 21st century learning (PAK-21) concept. In this regard, schools are the best place for teachers to apply 21st century skills. The application of these elements of the 21st century skills can achieve through the Malaysian Education Quality Standard 2 (SKPMg2) with particular attention to Standard 4 [8]. This ambition reinforced by the implementation of the Transformation School Program 2025 (TS25), which supports five key pillars to produce superior human capital, including promoting active student engagement and producing competent and highly motivated teachers.

On the other hand, [9] explain that competence is a crucial characteristic of how a person behaves or thinks in different situations and adapts to the changing times. Attributes of expertise are a combination of knowledge, skills, and abilities that translated through specific behaviors in completing a task or position [10]. According to [11], competence is acquired through either work experience, life experience and can be learned or practiced. Therefore, competence formulated as a set of knowledge, skills, personal characteristics, and ways of thinking of a teacher in performing the tasks efficiently and effectively according to current demands. What matters is that this skill or competence can learnt and upgraded according to current needs.

Thus, 21st century skills implementation mechanisms need to be refined and applied by teachers to improve their competence. This situation has a massive impact on the teaching and learning process. Teachers' ability to use 21st century skills based teaching has successfully increased student motivation and engagement in developing these skills [7]. However, large class sizes, lack of teaching and learning facilities and a less conducive environment are vital challenges for teachers in implementing 21st century skills based teaching [12] [13]. The weakness mentioned above is something that never solved until now. If this phenomenon persists, it is unlikely that teachers will be able to demonstrate high self-esteem in developing 21st century skills.

Therefore, further research is an indicator to examine the impact of teacher competence on 21st century skills in Malaysia. These skills are essential because they include thinking skills, ways of working, tools for working, and living skills in today's world [14]. Previous studies have demonstrated the importance of teacher competence in 21st century skills and its influence on improving teaching and learning quality [12] [15]. Besides, specific research on 21st century skills among teachers is still inadequate [16]. Based on the findings, it raises the possibility that studies involving 21st century education need to be expanded in Malaysia, especially in TS25.

1.2. Research Objectives

The objectives of this study are as follows:

- a) To determine the level of teacher competency and 21st century skills,
- b) To determine the differences in 21st century skills based on demographic (gender and age cohort),
- c) To identify the relationship between teacher competency and 21st century skills,
- d) To identify the effect of teacher competency on 21st century skills.

2. Literature Review

2.1. Teacher Competency

Competence is a crucial characteristic of how a person behaves or thinks in different situations and adapts to change over time [9]. Besides, competence is something that one does, and the results are observable [17]. Although the meaning and definition of the term competency still debated [18], the purpose of this study is to adapt the definitions proposed by [19]. According to [19], competence is a group of behaviors that play a role in achieving the desired outcome or outcome. In other words, the capability is a person's ability to apply or use his or her knowledge, skills, abilities, behaviors, and personal characteristics to perform a difficult task in particular roles and positions.

According to [20] there are five main components of competence: (i) knowledge - referring to one's information and knowledge, (ii) skills - referring to one's ability to perform a particular task, (iii) self-concept and values - refers to a person's attitude, values, and image, (iv) characters - the ability to perform tasks in his / her field and (v) the motives - emotions, desires, physiological needs or impulses to action. The combination of elements of nature and reason has identified as a critical driver for a person to perform tasks without strict supervision. These five components of competence are crucial behaviors that influence high performance. This concept of competence explained in Figure 1.

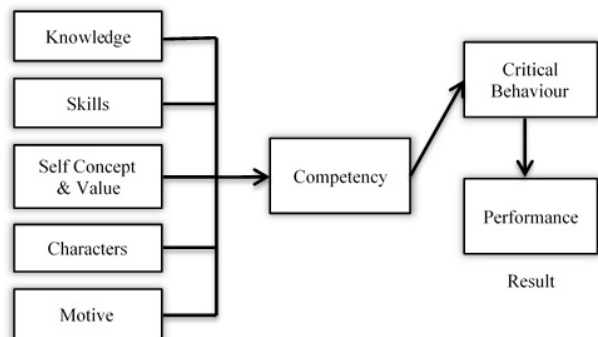


Figure 1. Competency Concept by [20]

The field of industrialization has succeeded in highlighting its competency model until the concept has adopted in education. In the educational perspective,

competence described as a combination of knowledge gained through experience and teachers' understanding of teaching practice [7]. Expertise is also a group of behaviors that play a role in achieving the desired outcome [19]. Meanwhile, [9] explain that competence is a complex undertaking, but the development and application of the competency model is an investment in proven human resources to achieve a more effective and productive workforce.

Previous studies have provided a positive picture of competency building to produce quality and professional educators [7] [21]. The ability of teachers to translate strategies, integrate knowledge and skills through reflective practice had been a significant turning point for the successful implementation of 21st century skills practices. Other studies prove that competent teachers are the ones who benefit their students [22]. High teacher competence not only takes place in the classroom but also engages in the implementation of co-curricular activities [23]. Furthermore, studies among Islamic Education faculty have shown that top competencies in ICT have helped to improve the quality of student learning even though e-learning culture is still low [24].

2.2. 21st Century Skills

The 21st century has changed all aspects of human life. The various challenges that need to address are the effects of globalization, liberalization, and the development of ICT. Among the significant challenges of the national education system to produce highly skilled Malaysians in various fields through dynamic learning spaces [2]. In this regard, Partnership for the 21st century has developed the P21 Framework Definition as an effort to help teachers integrate 21st-century skills in teaching.

Undeniably, the quality of the education system depends on the quality of the teachers who manage it. This statement shows that teachers play an essential role in the success of any educational program, including influencing student learning at a higher level. Teachers are also vital to economic success and education sustainability based on 21st century skills [25]. But it's not an easy task. Studies show that Singapore faces many challenges in developing 21st century skilled teachers [26]. This way makes the process of understanding the concept of PAK-21 very complex and requires high levels of competence among teachers. In addition to mastering the curriculum, teachers should have robust and empathic teaching skills and be able to learn current technology skills [27] [28].

According to [29], teacher education should be student-centered as well as integrating ICT in developing 21st century skills. This statement is in line with the study of [30], who found that 21st-century skills have a broader scope when compared to digital skills. Examples include technical skills, information management, communication, collaboration, creativity, critical thinking, and

problem-solving, as well as ethical awareness skills, cultural awareness, flexibility, self-direction, and lifelong learning. These skills intended to prepare students as future human beings to compete in the global market [4]. Therefore, teachers must possess these 21st century skills, such as necessary literacy skills, learning, and innovation skills, information, media and technology, and life and career skills, as outlined by the Partnership for 21st Century Skills.

2.3. Research Framework

In this study, teacher competence divided into seven dimensions, namely personnel character, curriculum, planning, assessment and reporting, pedagogy, professional, ICT, and school management and development. These seven dimensions refer to [31] Iceberg Competency Model. Each aspect tested to determine whether it has an influence or not on the 21st century skills of teachers in teaching. Figure 2 below shows the research framework implemented.

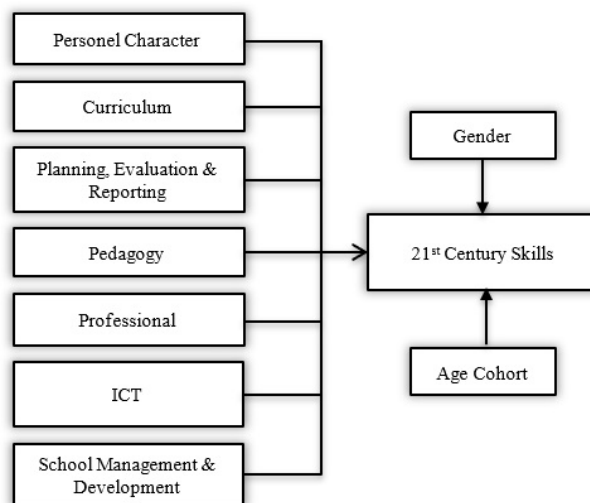


Figure 2. Research Framework

3. Methodology

This study is a cross-sectional study of the variables of teacher competence and 21st-century skills among high school teachers of TS25 Cohort 1 North Zone of Peninsular Malaysia. A quantitative approach used to collect research data based on a large population. The advantages of this approach are that it enables researchers to obtain large amounts of data and information at one time, easy to manage, process data quickly, and save on research costs [32]. This situation is in line with a large number of respondents and involves a large area of study.

3.1. Population and Sampling

The target population is the teachers at the TS25 Secondary School in the North Zone of Peninsular

Malaysia. The teachers are selected based on groups of groups with similar elements depending on the purpose of the study [33]. The aspect of population homogeneity needs to take into account the investigation to achieve its goals, as stated in the previous objective. According to the current population, the number of teachers in TS25 is 638 teachers. Therefore, a total of 242 teachers were selected as study participants, as suggested by [34], involving nine secondary schools.

Besides, the sample of teachers in this study used by a random sampling method. According to [35], this sampling method ensures better population coverage. However, there are some additional criteria to be followed to make teacher selection more accurate. Among the requirements was that the selected participant was engaged in a permanent teacher position while the administrators excluded from the study sample.

3.2. Instrumentation

This study contains two types of instruments. First, the Malaysian Teacher Standard (SGM) instrument issued by [36] used to measure the variables of teacher competence. A total of 42 items were adapted and processed based on several other teacher competence standards from other countries. Second, 21st century skill instruments adapted from the original 21st Century Knowledge And Skills In Educator Preparation source provided by the [3]. A total of 32 items used to illustrate the overall variables of 21st century teachers' skills in teaching.

The instrument reliability testing session conducted through a pilot study. According to [35], pilot study aimed to validate the suitability and reliability of the instrument before it distributed to respondents in the real field. Based on the pilot study, the authenticity of the instrument based on Cronbach's Alpha (α) values. Items with a high degree of reliability have the potential to be accepted as instruments in the actual study. Therefore, Cronbach's Alpha value of the tool described in Table 1.

Table 1. Reliability of Instruments

Sections	Items	α
Personal Characteristic	10	0.90
Curriculum	4	0.85
Planning, Evaluation & Reporting	5	0.86
Pedagogy	6	0.91
Professional	6	0.91
Information & Communication	5	0.88
Technology	6	0.91
School Management & Development		
Overall:		
Teacher Competence	42	0.96
21 st Century Skills	32	0.97

3.3. Data Analysis

This study involved descriptive statistics data analysis and statistical inference analysis. Descriptive statistics

used to describe participant profiles such as gender, age-cohort and teaching experience. Besides, the level of each study variable was determined based on the mean and standard deviation. Statistical analysis of inferences, such as the Pearson correlation also used to study the relationship between teacher competence and 21st century skills. Multiple regression analysis used to determine the predictor factors of teacher competence on 21st century skills. All data collected were analyzed using Statistical Package for the Social Sciences (SPSS) version 24.0.

4. Findings

4.1. Profile of the Participants

Participants in this study were 242 teachers of TS25 Cohort 1, North Zone of Peninsular Malaysia comprising 62 male teachers (25.6%) and the remaining 180 female teachers (74.4%). A total of 147 teachers (60.70%) were between the ages of 25 and 42 (Y generation), followed by 89 teachers (36.8%) aged between 43 and 54 (X generation). Besides, six teachers (2.5%) aged 55 to 59 (Baby Boomers) selected as participants in this study. Analysis of the data found that participant were various nations with 213 teachers (88.0%) are Malays, 15 teachers (6.2%) are Chinese, 11 teachers (4.5%) Indian and three teachers (1.2%) other races. A summary of participants demographic analysis is shown as Table 2 below.

Table 2. Participants by Gender, Age Cohort and Nations

Demographics	Details	Frequencies	%
Gender	Male	62	25.6%
	Female	180	74.4%
Age Cohort	Y Generation	147	60.7%
	X Generation	89	36.8%
	Baby Boomers	6	2.5%
Race	Malay	213	88.0%
	Chinese	15	6.2%
	Indian	11	4.5%
	Others	3	1.2%

4.2. The Level of Teacher Competence and 21st Century Skills

The interpretation of mean values in this study was categorized into three sections namely high (4.01 - 5.00), medium (2.01 - 4.00), and low (1.00 - 2.00) [37]. Based on the research analysis, the seven dimensions of teacher competence recorded different levels of the mean. Four of the seven dimensions of teacher competence at the highest level were preceded by professional with the highest mean values (M = 4.28, SD = 0.45), followed by personal characteristics (M = 4.19, SD = 0.41), curriculum (M = 4.18, SD) = 0.48), and pedagogy (M = 4.06, SD = 0.47). The other three dimensions were identified as mean scores at a moderate level starting with school management and development (M = 3.98, SD = 0.51), followed by planning,

evaluation and reporting ($M = 3.97$, $SD = 0.47$) and ending by ICT ($M = 3.80$, $SD = 0.60$). Overall, the level of teacher competence was high ($M = 4.07$, $SD = 0.38$), as shown in Table 3 below.

Table 3. The Level of Teacher Competency

Dimensions	M	SD	Level
Personal Characteristic	4.19	0.41	High
Curriculum	4.18	0.48	High
Planning, Evaluation & Reporting	3.97	0.47	Medium
Pedagogy	4.06	0.47	High
Professional	4.28	0.45	High
ICT	3.80	0.60	Medium
School Management & Development	3.98	0.51	Medium
Overall	4.07	0.38	High

Further, the results show that the dimensions of 21st century skills are at varying levels. Dimensions of various literacies ($M = 4.22$, $SD = 0.59$) recorded the highest mean values followed by life skills and career ($M = 4.08$, $SD = 0.54$). Meanwhile, the dimensions of information, media and technology ($M = 3.30$, $SD = 0.56$) and learning and innovation ($M = 3.79$, $SD = 0.54$) displayed moderate mean values. In summary, the mean value of 21st Century skills variables was moderate ($M = 3.97$, $SD = 0.45$) among teachers at TS25 secondary school, as shown in Table 4 below.

Table 4. The Level of 21st Century Skills

Dimensions	M	SD	Level
Various Literacies	4.22	0.59	High
Learning & Innovation	3.79	0.54	Medium
Information, Media & Technology	3.80	0.56	Medium
Life Skills & Career	4.08	0.47	High
Overall	3.97	0.45	Medium

4.3. Differences in 21st Century Skills Based on Gender and Age Cohort

Based on the t-test, the findings indicate that there was no significant difference between male and female teachers in 21st century skills, $t(240) = 1.50$, $p > 0.05$. This situation explains that there is no difference in the 21st-century skills level between male and female teachers at TS25 secondary school. However, the mean value of male teachers was higher ($M = 4.05$, $SP = 0.45$) compared to the mean of female teachers at the moderate level ($M = 3.95$, $SP = 0.45$) on 21st century skills. The results of the Levene's Test for Equality of Variance found that the p-value was insignificant ($p = 0.081$, $p > 0.05$), thus proving that both genders meet homogeneous variance assumptions and that these conditions met. Further details of the t-test analysis showed in Table 5 below.

Table 5. A T-Test Analysis of 21st Century Skills by Gender

Gender	N	M	SD	t-value	df
Male	62	4.05	0.45	1.50	240
Female	180	3.95	0.45		

Further, the ANOVA test showed no significant differences based on age cohort on 21st century skill level ($F = 2.86$, $df = 241$, $p = 0.06$). However, Levene's Test for Equality of Variance showed that p values were not significant ($p = 0.728$, $p > 0.05$), then the variance of age group or generation cohort is homogenous and fulfilled. Table 6 shows the mean scores for Baby Boomers generation at the high level ($M = 4.41$, $SP = 0.45$), while the X generation ($M = 3.96$, $SP = 0.43$) and Y generation ($M = 3.96$, $SP = 0.46$) are at the medium level to 21st century skills.

Table 6. An ANOVA Analysis of 21st Century Skills by Age Cohort

Age Cohort	N	M	SD	F	df
Y Generation	147	3.96	0.46	2.86	2,239
X Generation	89	3.96	0.43		
Baby Boomers	6	4.41	0.45		

4.4. Relationship between Teacher Competence and 21st Century Skills

Based on Table 7 below, it shows the relationship between professional competence against 21st century teachers' skills in teaching. Based on the Pearson correlation coefficient (r), both variables had strong correlations, with $r = 0.772$, $p = 0.00$ ($p < 0.01$). This result demonstrates that teacher competence provides a strong link to 21st century skills in teaching for TS25 North Zone of Peninsular Malaysia teachers. The results of the Pearson correlation are shown in Table 7.

Table 7. Correlation Analysis between Teacher Competence and 21st Century Skills

Variables		TC	21 st CS
TC	Pearson's Correlation	1	0.772**
	Sig. (2-tailed)		0.00
21 st CS	Pearson's Correlation	0.772**	1
	Sig. (2-tailed)	0.00	

(Note: TC – Teacher Competency; 21st CS – 21st Century Skills)

There are seven dimensions of teacher competence tested in the search for 21st century teachers' skills. The dimensions of school management and development showed a significant and strong correlation between the seven dimensions ($r = 0.673$, $p < 0.01$), followed by professional practice ($r = 0.661$, $p < 0.01$), and pedagogy ($r = 0.652$, $p < 0.01$). At the same time, there are three dimensions that show a strong relationship with personal characteristics ($r = 0.593$, $p < 0.01$), followed by planning, evaluation and reporting ($r = 0.587$, $p < 0.01$), information and communication technology ($r = 0.593$, $p < 0.01$), and concluded by the curriculum ($r = 0.505$, $p < 0.01$). The correlation coefficients based on the dimensions of teacher competence and 21st century skills among teachers are summarized, as shown in Table 8 below.

Table 8. Correlation Analysis Based on Teacher Competency Dimensions

	Dimensions	21 st CS
Pearson's Correlation	Personal Characteristic	0.594**
	Sig. (2-tailed)	0.00
	Curriculum	0.502**
	Sig. (2-tailed)	0.00
	Planning, Evaluation & Reporting	0.587**
	Sig. (2-tailed)	0.00
	Pedagogy	0.652**
	Sig. (2-tailed)	0.00
	Professional	0.661**
	Sig. (2-tailed)	0.00
ICT	0.568**	
Sig. (2-tailed)	0.00	
School Management & Development	0.673**	
Sig. (2-tailed)	0.00	

(Note: 21st CS – 21st Century Skills)

4.5. The Effect of Teacher Competency on 21st Century Skills

The results of the multiple linear regression analysis are shown as in Table 9 below. The value of R² explains the amount of the variance in 21st century skills that is a dependent variable. This result means that the seven dimensions of teacher competence contribute 63.50% to the 21st century skills of teachers in teaching in the TS25 North Zone of Peninsular Malaysia. Meanwhile, the value of F = 58.134 in the ANOVA analysis results revealed that there was a significant level with p < 0.05.

Table 9. Multiple Linear Regression Analysis of Teacher Competency on 21st Century Skills

Dimensions	Beta	T	Sig
(constant)		0.920	0.000
Personal Characteristic	0.141	2.470	0.014
Curriculum	0.023	0.390	0.697
Planning, Evaluation & Reporting	-0.007	-0.106	0.915
Pedagogy	0.147	2.278	0.024
Professional	0.174	2.658	0.008
ICT	0.197	4.042	0.000
School Management & Development	0.330	6.242	0.000
R ² value			0.635
Adjusted R ² value			0.624
F Value			58.134
Sig.			0.000**

According to Table 9, the findings indicate that there are five dimensions of teacher competence that have a significant impact on 21st century skills. These dimensions of school management and development ($\beta = 0.330$, $p < 0.05$) accounted for the greatest significant influence followed by information and communication technology ($\beta = 0.197$, $p < 0.05$), professionals ($\beta = 0.174$, $p < 0.05$), pedagogy ($\beta = 0.147$, $p < 0.05$), and personal characteristics ($\beta = 0.141$, $p < 0.05$). However, curriculum ($\beta = 0.023$, $p > 0.05$), and planning, assessment and reporting ($\beta = -0.007$, $p > 0.05$) did not contribute significantly to the 21st century skills among TS25 teachers of Northern Peninsular Malaysia. Overall,

dimensions of teacher competence accounted for 63.5% of which R² values 0.635 on 21st century teachers' skills.

5. Discussions

Teacher competence or professionalism, integrating practical knowledge and contextual knowledge through the practice of continuous reflection has always been a critical turning point for successful implementation of 21st century skills practices. Average worldwide studies have shown that there are positive signs in building quality educator competencies [7] [21]. Indeed, a competent teacher is the one who benefits his students. This view supported by a quantitative study of 91 teachers who found that teachers had excellent competence in dealing with dyslexic students at 64.8% and reinforced with the results of their interviews [22]. Not only in the classroom, but teacher competencies highest in the implementation of co-curricular activities. Besides, teachers can evaluate their ability to apply ICT in improving the quality of teaching and learning of students. Studies among Islamic Education lecturers have shown that they have a high capacity to use ICT, but the ability to create e-learning culture is still low [24]. Thus, these findings support the findings of this study where the level of competency of TS25 secondary school teachers in the Northern Region of Peninsular Malaysia is high.

As predicted, the findings indicate that the 21st century skill level is at a moderate level. This situation is supported by previous studies that have found that the application of strategies and thinking skills in teaching is at an average level [38]. In addition to teaching-based teaching, the use of media and technology is also one of the methods of teaching strategies based on 21st century skills. According to [39], the readiness of teachers to use multimedia in teaching is high. But complaints about infrastructure weaknesses and access to the internet have significantly affected teachers' confidence in media and technology use. Therefore, [40] suggest that ICT competency training and management implemented to improve teacher competence. Teachers believe that the use of media and technology can foster action in producing interactive learning and ultimately improve the quality of teaching [41]. These studies illustrate the confidence and success of education practitioners to interact and adapt various 21st century skills in improving teaching quality.

Regarding gender, the findings show that there is no significant difference between male and female teachers in 21st century skills practices. However, higher meanings of male teachers than female teachers indicate that they are more likely to integrate elements of 21st century skills into the classroom teaching and learning process. This view is also supported by [42], who found that male teachers are more willing to explore, deepen, and more receptive to innovation than female teachers, in particular,

using technology.

Meanwhile, age factors are associated as determinants of acceptance and implementation of a change in teacher teaching style. However, the findings of this study reveal that in contrast to age, teachers do not show significant differences in 21st century skills in teaching despite differences in mean values. According to [24], the 21st century skills element found no significant difference between the age of teachers based on the experience of teaching 21st century skills. The same view was expressed by [43] through his study, which found that age is not a barrier for teachers to apply teaching based on 21st century skills. In conclusion, the ability of teachers to absorb elements of 21st century skills in lesson depends on their effectiveness rather than age factors.

As you know, PPPM 2013-2025 has given a severe emphasis on the transformation of education based on new skills of the 21st century. The results of this study are in line with national education aspirations. Teacher competence found to show a strong and positive relationship to 21st century skills among TS25 secondary school teachers in the Northern Region of Peninsular Malaysia. As such, it provides a positive indication of teachers' ability to incorporate 21st century skills in teaching. But it's not that easy, and other studies show different findings. Teachers need to enhance their communication skills, collaborate, be more creative and innovative and ICT literate to succeed in applying 21st century skills in teaching [44]. Recently, ICT has succeeded in changing the daily routine of teachers in formulating teaching strategies in the classroom to support the implementation of the existing curriculum [45]. School principals and school management are vital to the success of 21st century skills development, especially in the provision of ICT infrastructure, software and appropriate training opportunities to enhance teachers' competencies.

The final objective of this study was to determine the dimensions of teacher competence influencing 21st-century skills. The study found that personal characteristics, pedagogy, professional, ICT and school management and development contributed 63.5% of 21st century skills. Previous studies show that the dimensions of school management and development strongly significant by the success of the 21st century skills practice. The survey of [46] acknowledged that school management and development cooperation are crucial to 21st century skills among teachers and thus improve student quality. In line with this, the school management is responsible for fostering and realizing teaching based on elements of 21st century skills and student-centered learning as well as effective use of technology [15]. Therefore, competent leaders and teachers are needed to build schools effectively.

In the meantime, pedagogy also influences 21st century skills. This finding is in line with [47] recommendation for the pedagogical shift towards emphasizing critical

thinking skills by encouraging them to use inductive and deductive reasoning, analyzing, interpreting, reflecting and evaluating. Furthermore, 21st century learning and job descriptions are not merely related to the application of technology alone, however it more important is the ability to engage in independent critical thinking, and the high level of problem-solving in pedagogy as the technology used. In this regard, school leadership should encourage teachers to produce high impact pedagogy with the help of technology [40],[41].

6. Conclusions

The 21st century skills-based teaching is increasingly being emphasized among educators, either teachers or school administrators. In this case, student learning can enrich through PAK-21 and also can translate through the active involvement of teachers in 21st century skills-based teaching. Teachers have great opportunities and competencies to diversify their teaching methods, and at the same time, the presence of technology helps create a more interactive and meaningful teaching environment. This situation, in turn, enhances student engagement in each activity. High competencies in the implementation of teaching based on 21st century skills elements have enabled teachers the opportunity to explore and generate more ideas for translating learning outcomes more efficiently [26],[30].

Teacher competence has a massive influence in ensuring that 21st century skills practices are implemented successfully in educational organizations. As a teacher, they can hone their talents and polish their potential to embody superior personal competencies. Thus, the 21st century's new skills that educationists often acquire can be realized through a more inclusive and real-world approach by competent and highly motivated teachers. Therefore, the scope of 21st century skills related research among teachers needs to expand. Aspects of future studies need to be more comprehensive, including testing of influences and the production of models that have an impact on 21st century skills culture.

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