Systematic Literature Review: Why Design and Technology Teachers Need to be Competent?

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Abstract--- *In Malaysia, the primary school life skills curriculum began in 1983. However, the demands of globalization and the need to produce knowledge workers have brought about significant changes to the curriculum. Malaysian Education Ministry has created a new curriculum to integrate the education system in line with the aspiration of producing students with creative and critical thinking skills. The Malaysian Education Development Plan (2015-2025), which guides teachers, also outlines the educational needs of students to meet the challenges of life in the future. Thus, the Life Skills Curriculum replaced with the subject of Design and Technology. This review study aims to identify (1) the importance of competence for teachers' Design and Technology (DT) and (2) the implications of the capability to teachers' Design and Technology in the technical and vocational education system in the Malaysian context. The total of 13 documents articles identified to discuss retrieved from 2010 to 2019. All the items uploaded from the e-journal system provided by the university and used to identify the themes in previous studies. While PRISMA will be used to determine which research, journal is appropriate to be selected and has empirical data. The results of this systematic review included, Students Achievement, Technology, Quality Teacher, Professional Development, Lifelong learning, Learning Support. This review studies recommended teacher to mastery in lifelong learning skill to develop their competency and expertise. Meanwhile, this study expects to assist the Ministry of education and Design and Technology teachers in determining their competencies in performing school tasks.*

Keywords--- Design and Technology, Competency, Systematic Review.

I. INTRODUCTION

Transformation in education reflects the efforts of the Ministry of Education Malaysia (MOE) to make changes in the field of education to realize the hope of the community to produce quality students. Then, to ensure the success of human capital in achieving national goals, the role of teachers is seen to significantly influence student achievement [1]. Therefore, teachers as a backbone of the education system need to know and understand the concept of work, credible, and capable of delivering educational, ethical, and highly skilled content. Understanding the concept of quality work competence in this field of education will influence teachers' duties in carrying out their tasks [2].

The Design and Technology subject is one of the new curriculums introduced under the Primary School Curriculum (CSSP) beginning in 2014 to replace the Integrated Life Skills (Curriculum Development Division,

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2018). This subject needs to be studied by students at level 2 in primary school, starting in year four. This subject is closely related to the design standards of using technology to produce a product by combining creative and critical thinking skills in technical, agricultural technology, home science, and entrepreneurship [3]. Design and technology teachers, therefore, need to have different competencies than other academic teachers as these subjects involve theory and practice skills. In Vocational studies, there are other types of task that the teacher needs to deliver. This vocational subject needs to prepare students for the demand's jobs in the future.

Based on McClelland [4], outlined that competence is the critical things that need to be adopted by employees. The competent employees are the leading resources for all organization to acquiring a competitive advantage. While, Boyatzis [5] also introduce that competency is a set of knowledge, skill and ability for an individual characteristic to be measured. Every organization have their profile competencies regarding the job [6]. Therefore, teachers need to know the importance and implications skills that they need to master to facilitate and implementation of the teaching and learning process more effectively. This competency will ensure that the human capital they teach is in line with the curriculum that has been created.

II. PROBLEM STATEMENT

The establishment of education policies, the National Education Philosophy, Vision and Mission of the KPM has been ineffective due to the failure of teachers to recognize the importance of mastering the competencies. Teachers require in their field which will lead to lower levels of self-awareness of their duties, commitments and responsibilities as educators to less quality [7],[8];. The burden of teachers is required in supporting the MOE requirement to achieve advanced country status by 2020 [9]. Therefore, all teachers need to assists in implementing the MOE mission and aspiration to produce quality teachers in line with the needs of the country.

Design and Technology teachers need to understand their role as curriculum implementers as they are trained with a variety of skills to deliver it on to their students as well as be skilled in performing tasks and responsibilities effectively. However, in reality, the competency and ability of teachers to perform their duties effectively remain doubtful, given the phenomenon of deterioration in student achievement.[10]

The issue of teachers lacking competence is becoming a problem not only in Malaysia but throughout the other country [11]; [12]; [13]. Some teachers do not seem to fully understand the importance of competence, while some teachers are less aware of the implications if they are less competent in carrying out their assigned tasks. In another while, it affects the effectiveness of their delivery in teaching and learning; teaching methods are not exciting and often burden the organization with various problems. Students who are having difficulty understanding the objectives of the lesson to be delivered will affect students' reactions, such as bored and affect their academic achievement.

The issue of underprivileged teachers in the performance of their duties is a burden on the nation and negatively impacted the education system, thus affecting the quality of the country's low education [14]; Therefore, the review of this journal/article is to clarify the importance of identifying the competencies of teachers, especially Design and Technology primary school teachers. Studies measuring competency levels have conducted frequently, but no

reviews have performed on the skills of Design and echnology teachers in-depth in primary schools in the Malaysia context. Therefore, there is a need for further competency studies to identify teachers' competencies in carrying out their tasks.

Objectives of the Review Study Is

- Identify the importance of competence for Design and Technologies teacher in Malaysia.

- Identify the implications of capability for Design and Technologies teachers in Malaysia.

III. METHODS OF THE REVIEW

In this study, we use a systematic literature review process. The study methodology is an elaboration of the form of the framework to be applied to achieve the objectives of the study. In this study, the PRISMA method used to determine the selected articles is an article with empirical data. This journal or article is available through Scopus, Springer, Emerald, Google Scholar, and Mendeley. The document analysis method used to obtain the results from the word analysis frequency and word search string as follows in table 1 below:

Table 1: Word Searching

Search string from Scopus:
TITLE-ABS-KEY (("important" OR "required" OR "need" AND "competency" AND "teacher")) AND (LIMIT-TO (open access,1)) AND (LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016) OR LIMIT-TO (PUBYEAR,2015) OR LIMIT-TO (PUBYEAR,2014) OR LIMIT-TO (PUBYEAR,2013) OR LIMIT-TO (PUBYEAR,2012) OR LIMIT-TO (PUBYEAR,2011) OR LIMIT-TO (PUBYEAR,2010)) AND (LIMIT-TO (LANGUAGE,"English"))

Purpose of this study to identify (1) the importance of competence and (2) the implications of competence for Design and Technology teachers. The journal or article downloaded is the use of online source articles in e-journal materials provided by the UTM library through a subscriber database.

Search string from Mendeley:
"competency" AND importance" year: 2010 to 2019
"teacher AND competency" year: 2000 to 2019
" review AND competency"year:2010 TO 2019
"need AND teacher AND competence" year: 2005 TO 2019

IV. FINDINGS

Through the selection of the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) method, there are several processes implemented so that the selected articles are required (identification, screening, eligibility, and included). Figure 1: below shows a flow chart of how the article/journal selection process implemented. Four phases have used to select empirical articles. The first phase is identifying the item through a

database founded that 113 items match with research objective. All materials upload from e-journal database provided by the university. The second phase is screening. In this process, the overlap, irrelevant and the duplicates have to remove, and the total left is 43 articles. Next, the eligibility process has to do. This process needs to read full articles to identify that the items can answer the objective of the study. The total of 23 articles needs to synthesis. The last phase included. The whole is 13 materials used in this review to gather the data.
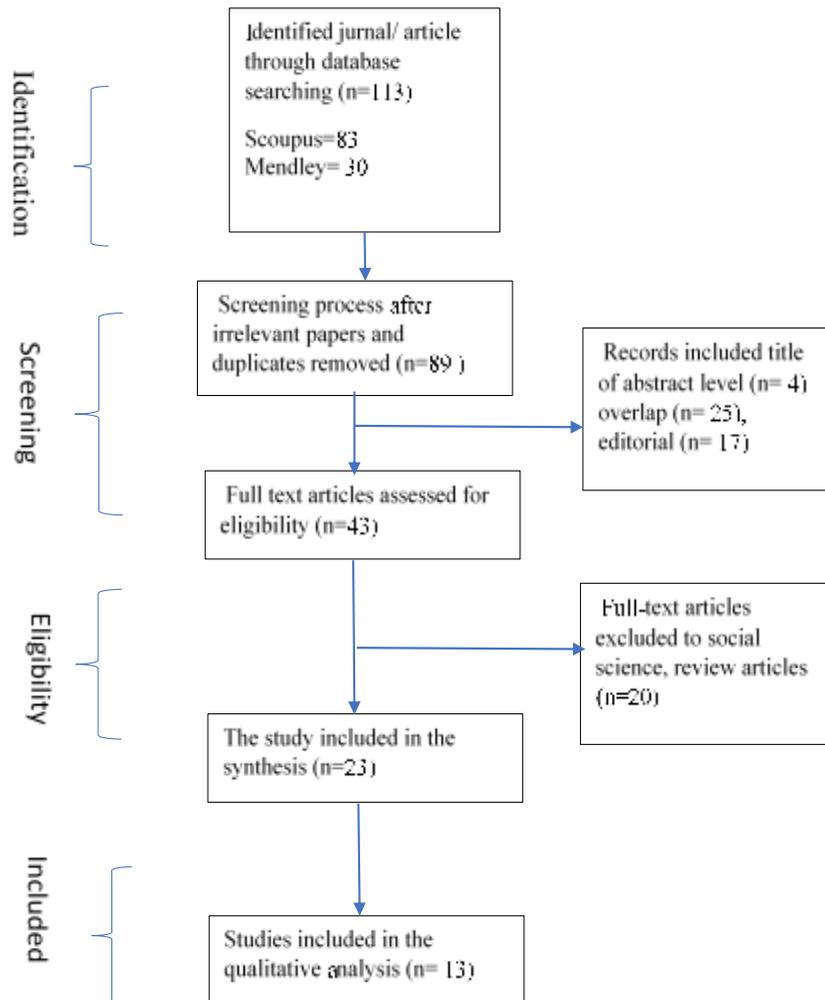

Fig. 1: Systematic Review Flow Diagram [15]

Table 2 shows the results for the theme that retrieve from the articles. There are three themes for the research questions one namely, Technology, Students achievement and Quality of teacher. For the research questions two, there are three themes, Professional Development, Lifelong learning and Learning support. The results will elaborate more below.

Table 2: Findings for 13 Articles in this Study

Bil	Authors	Important			Implications		
		Students Achievement	Technology	Quality teacher	Professional Development	Lifelong learning	Learning support
1.	Ioana Gabriela Marcut (2018)	/			/	/	/
2.	Kunter (2013)	/		/	/	/	
3.	Cretu (2019)	/	/	/	/	/	
4.	Zakirova (2016)	/			/		/
5.	Shukla Shashi (2014)	/		/	/		/
6.	Adnan Hakim (2015)	/		/	/		/
7.	Servet Celik (2016)	/		/	/		/
8.	Prasertcharoensuk (2015)	/		/	/		/
9.	Kamil (2014)			/	/		/
10.	Wagiran (2019)	/	/	/	/		/
11.	Arifin (2017)	/		/	/		
12.	Jailani (2016)	/	/		/		/
13.	Jancenlle (2015)	/		/	/	/	/
	Total	12	3	11	13	4	10

Result

Research Question 1: What is the importance of competence for Design and Technology teachers?

Students Achievement

Based on the findings, 12 out of 13 articles agreed that the importance of competencies in student's achievement. Student's achievement is one of the requirements to the teacher in their job scope. The teacher needs to identify, develop and create activities to bring out the talent of students. According to Ioana Gabriela Marcut, [16] , the teacher needs to help students acquire not only the skill that is easiest to teach and most accessible to test but more critical is the ability to live in the future and the competencies for a teacher can allow this skill. Kunter [11] found that teacher with a high pedagogical knowledge would enhance students cognitively activating tasks.

Meanwhile, Cretu [18] findings that teachers are a person in developing the students' competencies. Based on Jancenelle [19], students performance based on teacher competencies. Besides, students need a teacher who understands them and their needs with sensitivity. Students want teachers to follow their instincts, learning needs and tendencies along with their capacities and abilities [20].

Other findings stated that the teacher must strive to think and plan carefully to improve their performance for student's achievement. Students achievement means students understand what should their to do and what should their not to do [21] The statements of effective teacher educators play a significant role in facilitating and supporting the reflective learning process can develop students talent is vital [22]. Prasertcharoensuk [23] agreed to that relationship between teacher-students had a significant effect on students achievement motive in the study. It also mentioned that teacher competency is a factor for self-development found to affect students learning achievement too.

Wagiran [24], also found that vocational teacher should be competent because of the school graduate required to have some new skill that is different from the older era. Students need more expertise and experience a line with the scope of job skill in the future. The critical role for teacher its to prepare students have the ability and proficient doing the task at the workplace. Pedagogy skill of teachers can improve the students' knowledge to produce with competitive job marketability [25] The importance of students achievement produces an excellent result for teacher development and the quality of their jobs.

Quality Teacher

Quality of teacher in this study means the teacher can achieve the requirement has underpinned of the Ministry of Education (MOE). In these studies, ten articles discuss this theme. The quality of the teacher refers to all teacher-related characteristics that produce a favourable educational outcome [26];[18].tells that, to facilitate the best start for the future of students, the teacher must be of high quality in their competencies. The teacher needs themselves to develop diverse skills to meet the challenges of an increasingly demanding teaching profession.

Following, Jancenelle [19] stress that the teacher quality has become the focus of intense international attention and concern. Thus, to realize the matter and the quality of the process would require teachers maximum performance in their competencies [21]. Continued with this statement, [22], was highlighted that teacher need to prepare the documentation to ensure the quality of their education and competencies are universally consistent. Besides, teacher competency factors were highly integrated with teacher quality in their process of learning and developing the students. With this quality of teaching, it can effect of teaching practices in classroom and teachers professional well-being [27]; [23].

According to Wagiran [24], comment that the quality of a teacher can develop potential students in the future, and productive teacher may have more responsibility for preparing job-skills for students. Arifin [28], agreed that the teacher is the backbone to impart the competencies and to ensure the quality of education. Yunos [25], also highlighted the process of learning and teaching its vital role for the teacher. As the communicator in the school, the teacher has more alternative to facing the problem in the school and community.

Technology

Based on the findings, only three articles have discussed technology. Technology related to teacher competencies due to rapidly world, the technology it is essential to apply with all area such as in the learning process or personal activities. Based on Yunos [25] highlight that technology allows the teacher to improve competencies

because the demand of digital competencies it's crucial now. Besides, the teacher should use new technology to create a conducive learning environment in enhancing students knowledge and skills. Teacher knowledge about technology can develop their competency in their scope of work [18]. In line with Wagiran [24], suggestions are essential for teachers to have technological knowledge, and therefore to be able to integrate them as technical competencies.

Research Question 2: What is the implication competence for Design and Technology teachers?

Professional Development

From the findings show that 13 articles have stress about professional development. Professional development it's the essential things that teacher should involve to enhance their competence. Ioana Gabriela Marcut [16]; Certu [18], mention that the changes in the future are boundless, then the teacher needs to adapt themselves with different conditions to make sure they're competent. Professional Development in teacher education it is very a line and essential to controlling the quality of the teacher in their profession [26]. It's also evidence that professional development courses or self- initiated learning activities contribute to the growth of teachers expert knowledge [19]

Based on, Zakirova [17], found that the experience of teachers shows that the effectiveness of any curriculum implementation depends on teacher professional development to improve their competencies. In the academic field, teachers need to ensure their competence is active than the need to strengthen their expertise with professional development such as courses, conferences and continuous learning [20];[21].

On the other hand, teachers need to know and acquire the standards competencies they should adopt because it can provide the guidelines for teachers in their professions. [22]. Teacher professional knowledge expects to be more comprehensive, rich and extensive in their file of the subject then professional development is the opportunities for teacher will arise their impact within the profession will advance, [23]. Correctly, in school climate and supervision by the managerial its can build teacher competencies and support for teachers professional development and professional well-being [21]. Teachers in vocational subjects play an essential role in communicating the learning process, so the need for retraining in their teaching is crucial as well as influencing and fostering competencies for newly-trained teachers [24]. Then, [29], mention it is essential to ensure that teachers are aware of the necessary competencies for future reference. Without the active involvement of teachers in professional development, it would be difficult to achieve the shinning human capital for the future [25]

Lifelong Learning

Lifelong learning it's continuing education. From the findings, four articles have agreed that lifelong learning can give implications for competencies. Based on Ioana Gabriela Marcut [16] tell teacher competencies were acquired by individual learning because the initial training education does not provide all the needed skills. Hence, the teacher has to prepare alone by personalized learning and to collaborate with others. Next, the success of a teacher in their profession it's based on their effort to explore and determine their skill included with motivation, belief and self-skill [26].

Regarding this theme, S. Celik, [22] stress that is learning its everywhere, the teacher can find their competencies in many places and many ways with the approach in lifelong learning. Jancenelle,[19] agreed and stated that the willingness of the teacher to do a job or task is critical for students to develop competence. The implications of lifelong learning can give a positive impact to the teacher in their scope of work.

Learning Support

From the findings, 10 out of 13 articles discuss learning support it's the implications of competencies for a teacher in design and technology. Ioana Gabriela Marcut, ,[16], recognize that the benefits of teachers themselves generating new knowledge with combine the community perceptions and contributions. Zakirova [17]; Prasertcharoensuk [23] similar agreed that the organizations should ensure of set specialized knowledge and skills for further development appropriate methods of teacher's activity for learning support. Meanwhile, Jancenelle [19] tells that the scholars, policymakers and advocates need to support teacher to build their competencies for students in the future.

Additional learning support to sustain competencies are facilities and motivational support from school environmental. This support can encore teacher the fulfil the competency and knowledge requirements for new technology and new approach [20]. Based on Hakim, [21] suggest that one of the goals to be achieved by educational institutions, namely creation the collaboration in the community. Change the mindset, attitude and follow the pattern of students in this era.

Quality of learning support for a teacher can give a significant impact on teacher competencies.[22] Initiatives should focus on the school and classroom climate. School management, inspectorate and teacher training system should undertake comprehensive action to enhance effective teaching techniques and positive discipline [27]; [24]. The other contribution to give impact for improving teacher competencies its engagement with industries who can give feedback about the current technologies their needs [25]. All the learning supports its seen very important to feature and improve the competencies for the teacher.

V. DISCUSSION

The objective of this systematic review its to answer the question Why teachers in Design and Technology need to be competent? From this question, two purposes will build it's important and the implications of competencies for a teacher in design and technology.

The findings show that the highest theme was to discuss its Professional Development can give the implication of teacher competencies. According to Mohammed Sani, [30] professional teachers are teachers who practice professional development that involves professional skills, active in professional activities, contributing to the development of the teaching profession, and a foundation of professional readiness to assist professionally. There are very important that teacher engages with professional development [31]. Professional growth is one of the approaches to improving the quality of the teacher in delivering the learning. In the modern era, teacher need continues and explore the new teaching and learning techniques to overcome the digital native students [32].

Next to the second themes, it's a student's achievements. In managing the classroom, a teacher plays a vital role

in ensuring that the classroom environment is conducive and comfortable and appropriate for the teaching and learning process. According to Meng (1995), the role of teachers is very complicated. A teacher who is good at teaching, but unable to show warmth and affection will not be able to win the hearts of his students and may affect the effectiveness of the learning process [33]. Meanwhile, the process of learning needs a line with the current technology to enhance teacher competencies. Technology is the tools to help the teacher solve the problem. So, the teacher needs to acquire the pedagogical technology knowledge to improve their skill and sustain their competencies. Similar to Shulman [34] and Mishra and Koehler,[35] that underline the importance of experience in the teacher area. Another implication for developing competencies is learning support. Learning support can contribute a different kind of idea and suggestions to make sure the goal to produce a good student can achieve. They are learning to support it's very important to show that what is competencies should teacher require in the future. From this collaboration, it can give a significant impact for the teacher to prepare new skill for the future [36].

The powerful of teacher it can adopt the changing. An effective teacher is reflected in the quality of his or her education, and the effectiveness of his or her teaching The change of knowledge, skill and attitude can give positive engagement in the future education [37]. Most of the teacher should highlight that the essential things in school are the content and how to deliver a significant impact on student learning.

Need a Significant Study for Future

The need for significant and relevant future research for Design and Technologies teacher and curriculum is the priority. Design and Technologies is a foundation of the education system; there is a requirement of competent and committed teachers. Research about the content of design and technology curriculum need attention. Other ways to improve teacher's knowledge is technologies. Research the future about teaching technology could arrange to clarify the latest technology used in the process of teaching. Teachers 'perceptions on this subject need to be addressed, as teachers' perceptions can provide information on the topic being introduced, and stakeholders can provide feedback. Further research should outline how appropriate training can help teachers acquire new skills and develop teacher professionalism to better prepare for future challenges. However, as responsible teachers, we need to understand the tasks and beliefs they need to educate future generations.

VI. CONCLUSION

Competent teachers are required to conduct teaching sessions for Design and Technology subjects to meet the National Education Philosophy (NEP), which aims to produce balanced and holistic students in all aspects. As such, Design and Technology teachers today need to equip themselves with various skills to cope with the era of globalization in the world of technical and vocational education. The Malaysian Education Ministry initiative, which has provided multiple initiatives to assist teachers through the provision of different teacher training is an ongoing effort. In the organization, the most important of committed teachers is an asset in an educational institution because they are in charge of the future of the nation.

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