CONSTRAINTS AND CHALLENGES OF STEM EDUCATION IN MANJUNG DISTRICT'S SECONDARY SCHOOLS

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Abstract: As the trend indicates that students are becoming less interested in pursuing STEM fields in school, concerns over student involvement and participation in STEM education at schools are growing. This is made worse by the fact that 72.1 percent of SPM students decide against continuing their education in the future. Due to this circumstance, the nation's capacity to give expertise in STEM and vocational training won't be able to keep up with market demand and the advancement of the Industrial Revolution 4.0. The constraints and challenges faced by the Science teachers had been investigated from this study. A total of 168 secondary school teachers teaching in the field of Science in the Manjung district had been chosen as respondents in this study to identify the challenges faced by them in conducting STEM education. The descriptive analysis showed that 62.5% respondents agreed that school infrastructure is the main issues faced by these teachers in implementing STEM education. Good internet coverage and working equipment to help teachers in delivering STEM activities through online platform is still lacking in many schools. Research findings also have shown that the constraints and challenges faced by teachers in STEM education is at an average level (M: 3.176, SD:0.5264).

Keywords: STEM Education, Challenges, Constraints, Teacher Readiness School Infrastructure

1.0 INTRODUCTION

STEM Education in Malaysia have been introduced by the Ministry of Education (MoE) during the launch of Malaysian Education Blueprint (PPPM 2013-2025) on 6th September 2012. According to this blueprint, our education system will go through 3 phases and 11 shifts during the 13 years of implementing the Blueprint. The first shift is focused on delivering equal access to globally recognized education system. One of the objectives stated in that shift is improving the quality of STEM education in the nation. The STEM education in the MEB (2013-2025) have been conducted in three phases according to STEM Education Guide Book (2016).

(i) Wave 1(2013-2015): strengthening the quality of STEM education by enforcing the curriculum, building momentum and executing multiple learning models.
(ii) Wave 2(2016-2020) Accelerating and improving the system through campaigns and collaborations with relevant bodies to attract community interest and cooperation in STEM education.
(iii) Wave 3 (2021-2015): STEM education will be shifted towards excellence through increased operational flexibility.

MEB (2013-2025) has an important role in strengthening STEM education in Malaysia by improving the students' and teachers; interest towards STEM education. According to Bahrum, Wahid & Ibrahim (2017), STEM education was first implemented in the United States in the early 90s. The main purpose of it is to ensure to ensure that the citizens of The United States pursued Science, Technology, Engineering and Mathematics education as well as chooses careers in STEM fields such as engineering, medicine and science.

In the modern world, STEM education is something that is very important. Malaysia being a progressive country is in need of graduates with strong background in Science, Technology, Engineering, and Mathematics. According

to Hartmann and Ertl (2021), STEM courses are essential to both the students' academic and professional futures. As a result, students' lives are greatly impacted by their awareness of this issue. For them to be ready for the rapid changes of education in the 21st century, education reform sets high standards (Kennedy & Sundberg, 2020). According to Black, Muller, Spitz-Oener, He, Hung, and Warren (2021), the market for STEM occupations is expanding this decade. This is significant because it is clear that the world's development is becoming more and more dependent on science and technology, which is the primary factor in the workplace.

The National Policy for Science, Technology, and Innovation 2021–2030 was unveiled by the Ministry of Science, Technology, and Innovation (MOSTI) and is intended to direct Malaysia in the Science, Technology, Innovation, and Economy (STIE) sector in accordance with the 12th Five Year Plan. This policy lists a number of goals to be attained, including the fourth goal, which is to recruit top talent for the workforce to provide excellence. In this environment, it is more crucial to stress the value of generating a diverse group of students with the skills necessary to lead and drive the development of science, technology, innovation, and the economy (STIE) (MOSTI Strategic Plan 2021–2025).

Countries such as the United States and Europe is still barely reaching 50% percent of students involving in STEM fields (Zhongming, Linong, Xiona, Wangqiang and Wei, 2016). Thus, achieving the actual target of 60 percent is very important given the current scenario and situation. In addition, statistics have shown that 72.1 percent of students after finishing their SPM examination, do not continue their studies after that which shows that there is certainly a loss of energy resources that the country needs in the face of the Industrial Revolution 4.0.

In Malaysia many efforts have been implemented to improve the number of
skilled manpower in the research and industry fields. Henceforth, one of the initiatives was improving STEM education in our country. Few policies have also been launched to support the effort: (60:40) Vision 2020, Malaysian Education Blueprint (2013-2025) and the starting of Pusat STEM Negara since May 2018.

MEB (2013-2025) gives focus in closing the learning gap among the subjects being taught in schools (Aminah Mohamad Ayoub, 2018). Multidisciplinary education is important to improve the quality of education and preparing the nation for the upcoming challenges. In order to improve the number of student participation in STEM, four main initiatives have been formulated: strengthening STEM education, strengthening skills and capabilities, popularizing STEM education and incentives on STEM.

In the near future, some 80% of all professions will require some knowledge of Science, Technology, Engineering or Math. STEM-related jobs in manufacturing are expected to increase by 3.5 million by 2025, with more than two million of them going unfilled because they are not enough skilled workforce to enter the particular field. Therefore, Ministry of Education is working hard to improve the numbers of students to enrol in the field of STEM.

2.0 PROBLEM STATEMENT

STEM education in Malaysia is mainly focused in educating the students and providing them with the acquired skills for them to become skilled workforce in the future. The curriculum in our education system have also been embedded with elements of STEM education. STEM education has a positive relationship with 21st century skills. These are essentials skills to be developed today in order to help them face the challenges of globalization (Teo, 2019). One way of integrating these skills are through STEM education. STEM education and 21st century skills are interrelated with each other.

Lately, the importance of preparing students to enrol in the field of STEM is very much prioritised (Thibaut L. et al., 2018). Qualified STEM professionals are needed by our nation for us to thrive in the future. The Industrial Revolution 4.0 is here to catalyse innovation, creativity and job sustainability. For it to happen we need to invest in STEM education. The Ministry of Education had successfully reengineered the curriculum by implementing STEM elements. Provide. The nation will thrive under abundant Science and Technology workforce, when we are able to produce more STEM graduates. Pushing for STEM-educated human capital will enable our country to become a nation that emerge with tech disciplines and innovations in manufacturing, therefore will be able to establish a niche in the global market.

It is hoped that before 2020, Malaysia was declared as a developed country, the MoE has made STEM Literacy as part of the national curriculum that must be studied by all students at all levels of education in Malaysia. Unfortunately, it has not been realized yet. The number of students taking STEM subjects is declining every year (Maszlee Malik, 2019). This had caused our national education system to lose at least 6000 potential students in STEM fields every year (Hazami, 2019).

According to Ahmad Wazir Aiman Mohd Abd Wahab & Noor Akmal Shareela Ismail (2014) and Ismail et al. (2011), obtaining a degree just for a job is not enough. These graduates must be able to equip themselves with soft skills such as, problem solving skills, vast knowledge and communicative skills to be able to survive in the future. An awareness among graduates on the needs and expectations of the global job market is important to improve their skills in order to compete in a world that is ready for IR 4.0. (Ahmad Wazir Aiman, Mohd Abd Wahab & Noor Akmal Shareela Ismail, 2014). The Institute of Higher Education must create awareness among these graduates on the needs and expectations of the global job market as well as instil awareness of the importance of improving their skills in order to compete in a borderless world (Ahmad Wazir Aiman, Mohd Abd Wahab & Noor Akmal Shareela Ismail, 2014). Preparing the workforce for IR 4.0 must start early from the school level itself.

3.0 PURPOSE OF THE STUDY

The effectiveness of conducting STEM education is directly correlated with teacher quality according to Chang & Park (2014). Teachers are policy executing agents. They are responsible in integrating various teaching methods and strategies which in this context is integrating STEM elements in their daily teaching activities. It is up to them to show that STEM is not only memorizing theories and formulas.

The development of Pusat STEM Negara (PSN) in May 2018, is seen as one important step in integrating and strengthening STEM education in our curriculum. PSN is currently now assisting teachers all over Malaysia in implementing and integrating STEM elements in subjects like Mathematics and Science by introducing Inquiry Based Science Education and Inquiry Based Mathematic Education teaching methods.

Teachers play an important role in improving students' interest. Various activities and programs are implemented by the school to increase students' interest in STEM in order to motivate them to choose this field (Griffith, 2016; Morgan, Gelbgiser & Weeden, 2012). According to Sha, Schunn and Bathgate (2015), the variety of activities implemented in schools will not only increase the number of students to pursue STEM subjects, but is to ensure students are ready and suitable to engage in STEM careers.

The low acceptance level of Malaysian towards STEM is dampening the efforts of instil STEM education (Malaysian Science and Technology Information Centre (MASTIC), 2008; Organisation for Economic Co-operation and Development (OECD), 2012; KPM, 2013; Yusof et al., 2012). The enrolment of students pursuing STEM at the upper secondary level is only at 45.7 percent compared to the target of 46 percent in 2018(KPM, 2018; Nur &Tuan, 2018). As a result, our country is still experiencing a shortage of labour resources, especially in the technical and vocational fields. This situation is exacerbated, when there is a trend of students at the secondary school level increasingly neglecting STEM subjects in the selection of subject packages they take. Students are seen to be less and less interested in STEM (Noraini Idris, 2019).

This situation is contributed by lack of awareness of the potential of STEM career fields, lack of exposure to knowledge related to STEM fields, lack of efforts to intensify professional training on STEM education (Johnson & Sondergeld, 2016) and lack of concrete integration and application of STEM education in life (Bunyamin & Finley, 2016). Therefore, Siew et al. (2015) stressed the need for educational institutions, especially teachers to play a significant role in the implementation of STEM education curriculum in line with PPPM 2013-2025, not to mention STEM education initiatives that should currently be in the second and third waves of implementation. namely in the domain of revision of existing curriculum and implementation of new curriculum.

Generally, there is a problem in the acceptance of teachers, especially from the school management group, towards STEM education in Malaysia. There is still the issue of the school management being negative towards

the changes which has led to a situation where teachers do not get good cooperation due to, among others, the bureaucracy of the school management (Berita Harian, 17 March 2019).

This situation if not addressed can have a detrimental effect on the country's ability to compete in the provision of professional human resources, especially in the field of STEM. Taking into account the problems that have been discussed, the question arises as to the extent to which the planned implementation of STEM education can be accepted by teachers as implementers of STEM education curriculum in schools. Therefore this study had been conducted on identify the issues and challenges faced by the secondary teachers in the district of Manjung to implement STEM education.

4.0 CONSTRAINTS AND CHALLENGES IN STEM EDUCATION

Science teachers are also having some type of difficulties in preparing themselves to integrate STEM elements in the daily teaching and learning activities. The Ministry of Education Malaysia (MOE) has paid attention to the problem of teacher readiness, especially in assessing their competence in STEM integrated education. More efficient STEM implementation requires teachers to have in -depth knowledge of the Science, Technology, Engineering and Mathematics content they teach (Eckman et al., 2016). In addition, teachers should also have specific knowledge of how to teach STEM content to students (Thibaut L. et al., 2018).

Siti Nur Diyana Mahmud et al. (2018) had discussed programmes that had been carried out to upgrade Science teachers in Malaysia in the content of policy, teaching practices and issues that arises in teaching Science itself. The findings had shown that even though teachers are working hard to carry out STEM activities, but the understanding towards the curriculum that integrates STEM education is still not at a promising level.

A study carried out by Ejiwale (2013) had stated that the biggest obstacle faced by the nation regarding the implementation of STEM education is lack of qualified STEM based teachers. Teachers are still not well versed in the basic knowledge of STEM. Teachers' knowledge is highly related to teacher readiness. When teachers are seen struggling in the content and pedagogical knowledge of STEM education, teachers readiness level is said to be not at par. A study by Tamim and Grant (2013) also had the similar findings, where teachers are having difficulties in conducting project based learning that will promote STEM education in the classrooms.

Meanwhile Siew et al. (2015) had identified that school infrastructures and facilities at schools can't support the implementation of STEM education in the classrooms since it is not updated and incomplete. Teachers are struggling since they don't have a well equipped Science labs and good internet coverage.

Shernoff et al. (2017) had identified that time constraints also had been hindering the teachers' effort in conducting STEM education. Not only these teachers are facing time management issues but also inadequate teaching resources related to STEM education. Another study conducted among science teachers in Thailand by Wachira Srikoom and Chatree Faikhamta (2018) had also indicated that time constraints is the main challenge teachers face while implementing STEM education.

Another article by Sithole (2017) had identified that student readiness issues also must be looked into. Majority of students are found to be not ready for STEM education implemented in their classrooms. The negativity mindset that these students are showing are causing them to be distant and not engaged during their teaching and learning activities. Students' readiness level is influenced by factors like student acceptance, their prior knowledge, learning habit and study routine. If students are seen to have good study routine, their readiness and acceptance level would be much better. Therefore, by looking into previous studies and problem statements, the main issues identified in this study are Teacher Readiness, Time Constraints, Facilities/ Infrastructure, Student Readiness, and Teacher Training.

5.0 RESEARCH OBJECTIVES

This research had been carried out to identify the challenges faced by the secondary school teachers teaching in the field of Science and Mathematics from the Manjung district in conducting STEM education in their daily teaching and learning activities. It is also carried out to specify the main issues and challenges faced by those

teachers in based on their readiness level, time constraints, facilities around their schools, students' readiness and the training received by the teachers.

Therefore, the research objectives are

1. How is the implementation of STEM education is influenced by the level of teachers' readiness?
2. How is the implementation of STEM is influenced by time constraints faced by the teachers?
3. How is the implementation of STEM education is influenced by the facilities around the schools?
4. How is the implementation of STEM education is influenced by the level of students; readiness?
5. How is the implementation of STEM education is influenced by the amount of training received by the teachers?

6.0 METHODOLOGY

6.1 RESEARCH DESIGN

The research design used was a cross-section survey design based on gender and teachers teaching in the field of Science and Mathematics in the district of Manjung to identify the issues and challenges faced by these teachers in STEM education. Survey design is used that allows any issues and questions examined from different perspectives, especially based on the teachers' readiness, time constraints, facilities around the school, students' readiness and training received by the teachers on an issue discussed (Chua, 2006). In addition, survey design is essential in research that involves large sample size so that the findings can be generalized to the population accurately and effectively.

6.2 POPULATION AND SAMPLE

According to Gay et al. (2011), in a research, population in a study would be chosen realistically. The population in this study refers to all the teachers teaching in the Science and Mathematics field from 20 secondary schools from the Manjung district in the 2022. In this study, stratified random sampling method had been used. There are total of 297 secondary school teachers teaching in the field of Science and Mathematics. Therefore, the number of samples based on the Krejcie and Morgan (1970) table is 168 respondents.

6.3 RESEARCH INSTRUMENT

The research instrument used in this study is STEM Teaching and Learning Aspects Questionnaire (*Soal Selidik Aspek Pelaksanaan PdP STEM*) (SSAP). This instrument contains 18 items. The instrument had been modified and adapted from the Teachers' Perception Towards STEM Questionnaire (*Soal Selidik Persepsi Guru-guru Sekolah Terhadap STEM*) that was created by the Malaysian Science Academy (Akademi Sains Malaysia). This questionnaire had been used in the year 2017 throughout Malaysia to gain some feedback on the teaching and learning aspects on STEM education among the teachers.

The questionnaire used 5-point Likert Scale: Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree. This instrument consists of 5 domains: Teacher Readiness, Time Constraints, School Facilities/Infrastructure, Students' Readiness, and Teacher Training. This instrument had gone through back to back translation process. This is because, the instrument was delivered to the teachers in Malay, a language which they are able to comprehend easily.

Pilot testing procedure had been carried out first to identify the Alpha Cronbach value for testing the reliability of the instrument. The Cronbach Alpha value for this instrument after pilot testing was 0.830. According to Creswell (2012), any value that exceeds 0.8 shows that the instrument is highly reliable and consistent.

6.4 DATA ANALYSIS

In this study the data was analysed using IBM SPSS Software Ver 25.0. The data was analysed descriptively. Descriptive statistic was used to calculate the frequency, mean and the percentage of the data obtained from this

study. Later, the mean score will be interpreted using the Mean Score Interpretive table by Jamil (2002) as in Table 1.

Table 1: Mean Score Interpretive Table

Mean Score	Interpretation
1.00 - 2.33	Low
2.34 - 3.66	Average
3.67 - 5.00	High

7.0 RESEARCH FINDINGS AND DISCUSSION

The issues and challenges faced by the secondary school teachers from the Manjung district is shown in Table 2. From this table it is clear that the biggest challenge that are being faced by the secondary teachers from the district of Manjung is in the school infrastructure and facilities available around the school. 62.5 % of the respondents have agreed that they don't have sufficient and complete working facilities around the school for them to carry out STEM education.

Looking into the domain of Teacher Readiness most of the respondents (49.4%) have disagreed on the statement that they are not ready in implementing STEM education at schools. Only 9.6% of the respondents are admitting that they are not ready. Many respondents also agreed that they are having issues in time managements since only 6% of the respondents had disagreed with items regarding time constraints. Discussing on student readiness, it showed that many respondents agreed to the idea that students are still having difficulties in grasping STEM education. Meanwhile, 41.1% of the respondents have agreed that they still need trainings regarding STEM education in their classrooms.

Table 2: Degree of Agreement in Challenges Faced by Teachers in Conducting STEM Education.

Dimensions	**Degree of Agreement**		
	Low	**Average**	**High**
Teacher Readiness	83 (49.4%)	69 (41.0%)	16 (9.6%)
Time Constraints	1(6%)	120(71.4%)	47 (22.6%)
Facilities/ Infrastructure	12(7.1%)	51(30.4%)	105 (62.5%)
Student Readiness	24 (14.3%)	99(58.9%)	45(26.8%)
Training	41(24.4%)	58 (34.5%)	69(41.1%)

Table 3 below shows item analysis of each dimension in challenges faced by teachers in conducting STEM education. It can be seen that, respondents have reported higher degree of agreement in two dimensions: facilities at school and the amount of training received by them to conduct STEM education based teaching practices.

Table 3: Item Analysis for Each Dimension

Dimension	**Item Nu**	**Statement**	**Min**	**Standard Deviation**	**Degree of Agreement**
Teacher Readiness	1	I am not yet ready to practice STEM elements in my teaching practices.	2.4167	0.71273	Average
	2	I am not ready to try new approaches in STEM teaching practices.	2.7083	0.82152	Average
	3	I lack basic knowledge related to STEM teaching practices.	2.6786	0.82854	Average

	4	I am less motivated to do teaching practices related to STEM.	2.3571	0.80631	Average
	5	I think STEM activities are burden to teachers.	2.6071	0.87573	Average
	6	I think STEM teaching practices and activities are not practical.	2.6310	0.85863	Average
	Mean Score For Teacher Readiness		**2.5664**	**0.81724**	**Average**
Time Constraints	7	I do not have enough time to prepare appropriate teaching aids regarding STEM education.	3.4464	0.79489	Average
	8	I am struggling to plan a complete STEM education based lesson plan.	3.5893	0.95610	Average
	9	I am struggling to perform STEM education sessions effectively	3.1429	0.79884	Average
	10	I am unable to finish the prescribed syllabus due to time constraints.	3.2976	1.06417	Average
	Mean Score For Time Constraints		**3.3690**	**0.9035**	**Average**
School Infrastructure and Facilities	11	Technological facilities such as LCD in schools are inadequate	3.5833	1.04633	Average
	12	Incomplete school laboratory apparatus.	2.9702	0.91184	Average
	13	The internet access provided at the school is unsatisfactory	4.1488	0.75534	High
	Mean Score For School Infrastructure and Facilities		**3.5674**	**0.9045**	**Average**
Student Readiness	14	Lack of engagement in STEM education activities	2.9702	0.89192	Average
	15	The majority of students are not interested in the field of STEM	2.9345	0.81262	Average
	16	Students' academic achievement is not encouraging	3.6250	0.67182	Average
	Mean Score For School Infrastructure and Facilities		**3.1766**	**0.79212**	**Average**
Training	17	Lack of exposure related to STEM education.	3.1429	0.9920	Average
	18	STEM education based consolidation courses or training are rarely offered	3.2679	0.87871	Average
	Mean Score For School Infrastructure and Facilities		**3.2054**	**0.9353**	**Average**

In the domain of facilities and infrastructure at schools, most respondents are having trouble in receiving good internet access (M:4.1488, SD:0.75534). Internet access is important for teachers to conduct STEM based education since many activities can be done through online platform. Many references can also be found in various websites. The teachers need good internet now more than ever since the Covid Pandemic. Learning has been carried out through online platform and digitalised. Schools must be able to provide fast internet access to teachers in order to improve the quality of education in many ways. Having good internet access will open doorways to a wealth of information, knowledge and educational resources. It will help in increasing opportunities for learning in and beyond the classroom.

Training for STEM education must be focused on exposing teachers to STEM specific curriculum and skills that would help in the process of delivering the content to the students. But unfortunately, many respondents had agreed that they are rarely offered STEM education based consolidation (M:3.2679, SD:0.87871). These findings had been supported by Honey et al. (2014) where most teachers are seen receiving training in only one disciple and most of the time classes at all levels still have separate class periods for STEM subjects. Therein lies a significant challenge for teachers in promoting STEM education.

Given the complexity of cognitively activating instruction In the Teacher Readiness dimension, item 2 had the highest mean score (M: 2.7083, SD : 0.82152). This item had discussed on teachers having difficulties in trying

new approaches while teaching in STEM based classes. This finding is also similar to study by Avery (2013) and Lee et al. (2013) that identified most teachers only have knowledge and basic skills in teaching their own field only (Avery, 2013; Lee et al., 2013). According to a research by Roehrig et al. (2012) and Stohlmann et al. (2012) conducting STEM integrated pedagogies with a more authentic treatment of Mathematics and Science content will allow more student centred, meaningful, engaging and less fragmented learning experiences involving higher level thinking and problem solving skills.

The findings from the Teacher Readiness dimension is very much related to the finding from the Time Constraint dimension where Item number 8 had the highest mean score. The item discusses on the inability of teachers to plan a complete STEM education based lesson plan. When teachers are seen lacking of pedagogical content knowledge towards implementing STEM education teaching experiences, they will struggle to plan appropriately. Given the complexity of STEM teaching, time allocated for its implementation is critical. Studies by Newman et al. (2004), Wang (2011), Chichekiean & Shore (2016) and the recent study by Hofer et al. (2018) had suggested that teachers' perceived time constraints is seen as an obstacle to enhance students' conceptual understanding of STEM education. These findings are also similar to a study by Shernoff et al. (2017) and Wachira Srikoom and Chatree Faikhmta (2018). It basically agreed to the fact that teachers require more time in planning and executing STEM education teaching practices consistently.

Item 16 in the dimension of Student Readiness had shown the highest mean score (M:3.6250, SD:0.67182). This item had discussed on the level of students' academic achievement that is not supporting the delivery of STEM education at schools. Study conducted by Wachira Srikoom and Chatree Faikhmta (2018) had discussed one of the challenges faced to conduct STEM education is student readiness. STEM education requires students to be cognitively active and and contextually engaged with the knowledge taught. Another study by Wang and Degol (2016) had identified that the explanations for students' underrepresentation in STEM ;(a) cognitive ability (b) relative cognitive strengths (c) occupational interests or preferences. Kubat (2018) also had explained that students' readiness level is influenced by certain factors such as their interest, prior knowledge and lack of engagement among the students. Since students' readiness is different and affected by their own ability, it can be said teacher's role is vital in encouraging and helping them to understand the barriers and factors that influence their perception towards STEM education.

Item 18 in the Training dimension had the highest mean score (M: 3.2679, SD: 0.87871). It had been proven earlier in the Teacher Readiness dimension that they are concerned about the lack of subject matter knowledge on STEM content. Lack of in service training to implement STEM education had caused the teachers to feel not fully prepared. A study by Nadelson & Seifert, 2013) had stated that teachers needed clarity about how STEM education can be implemented into existing programs and able to have lasting impact.

8.0 RESEARCH IMPLICATION

STEM education is important for our students since Science and Mathematics are essential skills for global citizens. These skills are vital in building the foundations of economic and prosperity and needed in allowing our citizens in understanding this increasingly technological world and make informed choices about their future. Therefore, the integration of STEM education in Malaysian curriculum is highly impacted by the quality of educators as stated by Chang & Park (2014). Teachers as the main person in executing education policy are responsible in delivering various delivery method. Debating in the STEM education context, teachers are required to integrate the subjects realistically and not focusing in memorising formulas and facts alone.

Research findings had indicated that there are several challenges and constraints that Science teachers had to overcome to implement STEM education. The main challenges that had been identified are time constraints, school infrastructures and adequate training for these teachers. Having an issue in planning or executing STEM related teaching and learning activities especially in time management will require teachers to be creative in conducting strategies that will maximize the impact STEM education.

Hartmann and Ertl (2021) argue that STEM courses are not only part of today's education, but STEM courses will also help students in their future professional life. Therefore, awareness of this matter plays an important role in students' lives. Students are required to be prepared to face the rapid changes happening now globally.

Not only teachers are responsible in overcoming all these issues. The administrators and the department of education personals such District Education Department, State Education Department and Ministry of Education must play also their part. School must be fully prepared to integrate STEM education. Lack of instructional resources and training towards delivering STEM related teaching and learning activities will only be seen as a hurdle in their path to provide STEM opportunities for the students.

9.0 CONCLUSION

It is can be concluded from this study that secondary school teachers teaching in the field of Science and Mathematics are facing many issues to empower STEM education in their classrooms. Teacher readiness, students' readiness, lack of training, time constraints and school infrastructures had been listed as some of the challenges that faced by these teachers. All these issues have been directly affecting the teachers' teaching performances and their effort in empowering STEM education in school.

Since teachers are seen as a huge influence on a student's choice of subject matter or their decision to pursue a STEM career, lack of exposure and training related to STEM can greatly affect these teachers' performances in class because it gives negative effect in terms of their motivation, level of stress and also job satisfaction when teaching the students. Serious initiative needs to be taken by not only by the school administrator but also the higher authorities, such as District Education Department, State Education Department and the Ministry of Education. This is because teachers play an important role to instil students' interest and skills on STEM activities. If teachers are not up to date on this initiative and also lacking of skill to conduct or integrate STEM during teaching and learning or even school activities, it will give a huge impact on students.

To successfully integrate curriculum modifications or innovations in teaching and learning sessions, teachers must possess a certain set of abilities. According to Othman and Awang (2018), teachers' knowledge, abilities, and capacity to address issues relating to teaching and learning are what define how prepared and capable they are to execute curriculum change. Teachers with high levels of motivation and readiness will be more self-assured and likely accept the tasks assigned to them (Boset & Asmawi, 2020). The implementation of the STEM curriculum in the context of this study depends critically on teacher readiness.

School administrators must understand their support towards empowerment of STEM education is important. Teachers given with many workloads will have difficult time to prepare STEM activities in class, they will also have less time for class preparation due to overloaded workload at school. STEM activities require collaboration and cooperation that really need plenty of time to make it effective. When there is pressure by the school administrators, thus teachers will face the dilemma to finish the syllabus on time. This will hinder these teachers' efforts in promoting any new approaches.

In a nutshell, this study provided a unique viewpoint on the obstacles and limits that Manjung district teachers experience in empowering STEM teaching. These findings should have a positive impact on the implementation of STEM education in schools, especially for Malaysian secondary school teachers and curriculum planners who can use teaching-learning practises to design STEM projects and lessons that will encourage more students to pursue tertiary education and STEM careers.

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