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ISSUES AND CHALLENGES FOR THE IMPLEMENTATION OF PRESCHOOL STREAM EDUCATION: WHAT DO THE PRESCHOOL TEACHERS SAY?

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ABSTRACT

Preschool STREAM education is a philosophy and guiding principle. It is a way of thinking towards multidisciplinary approach, in which Science, Technology, Reading, Engineering, Arts and Mathematics are integrated in the early childhood programme to provide the young children with a well-rounded education and equipped them with the 21st century skills. In this aspect, preschool teachers' perceptions towards the implementation of STREAM education are crucial for the sustainability of STREAM education now and then. In this study, the objectives are to investigate preschool teachers' perceptions towards STREAM implementation, the challenges of implementing STREAM education, as well as to examine the differences between pre-service and in-service teachers' perspectives towards the implementation of STREAM education. For this study, a quantitative research design was adopted. The data was collected through a questionnaire survey and analysed using SPSS software, which was used to obtain descriptive statistics and perform t-tests. The participants involved 80 preschool teachers (40 pre-service; 40 in-service) in Petaling Jaya, Selangor. A questionnaire of 35-item was used. The result revealed that most participants have positive perceptions towards preschool STREAM education approach. However, the report indicated that there are differences between in-service and pre-service teachers in regards of the challenges in implementing preschool STREAM education. Moreover, the lack of teachers' expertise and professional training to integrate and implement STREAM learning activities are the main issues and concern of the in-service teachers. These findings suggested that teachers need training with relevant resources and effective materials for easy integration of content teaching and learning to sustain STREAM education as a frame of mind for effective implementation and desired learning outcomes.

Keywords: preschool STREAM education, perspectives, pre-service preschool teachers, in-service preschool teachers

INTRODUCTION

This research is concern on the implementation of preschool STREAM education, and the challenges faced by the preschool teachers. Currently, the attention and demand for the STREAM education gradually increases due to the complex challenges and problems that exist in our world today (Bahrum et al., 2017; Khalil & Osman, 2017). For instance, the increasing cases of health crisis; energy shortages; getting adequate clean water in future; environmental problems and climate concerns or even the widespread of Covid-19 crisis. In order to support and tackle the global challenges, it is not only requiring the nations to work together in achieving improved results, but also have to focus on the sustainability of the implementation of STREAM education to all ages. "Quality Education" is indicated in the UNESCO framework- 17 Sustainable Development Goals (SDGs) to develop the quality education system in promoting the life-long learning opportunities for all students, from early childhood all the way to tertiary education (UNESCO, 2017). Therefore, education plays a vital part in achieving SDGs and supporting the sustainable development of the STREAM education approach.

Malaysia's Ministry of Education (MOE) aims to cultivate innovation and capable human capital to transform the nation into a sustainable developed nation as well as meet the demand in an ever-changing world. In 2019, STREAM is a new approach introduced by MOE to deliver better STEM education in Malaysia (Lim, 2019). The National Education Blueprint (2013-2025) highlighted that STEM education is a critical transformation of the educational system project that should be instilled from preschool onwards to enhance the nation's STEM-related workforce. Preschool STREAM is regarded as the stairways to achieve the sustainability developmental goals. Therefore, preschool STREAM education as the early foundation has become important and essential to be implemented starting from early years as it can prepare more students to enter STEM-related fields in the long run. By paying attention to the quality of STREAM education, it can ensure the prosper economy in the future of Malaysia.

There is a considerable national interest in preschool STREAM education in Malaysia as the Ministry of Education has even set up its own national committee to spearhead STREAM initiatives especially in education of all levels (Ompok, 2020). According to Yalcin (2022), the children can be creative and productive producing solutions to problems by having prior knowledge with the emergence of more creative activities, in designed oriented STREAM applications. Preschool period is when the development of children is the fastest; the basic concepts are acquired quickly (Akcay, 2022). These basic concepts form the foundation for concepts that children will learn in their future lives. Early exposure to STREAM education enables young children to benefit from the integrated and exciting learning experiences which can contribute in acquiring 21st century skills which is crucial to later academic achievement (Dejarnette, 2018; Raja & Bahari, 2017). During the preschool period, young children are naturally equipped with the skills that form the basis for STREAM education (Yucelyigit & Toker, 2020). They are born scientists and engineers as they naturally learn through observation, exploration and experimentation; they are full of curiosity and enthusiasm for the environment around them (Dilek et al., 2020).

By providing early childhood age children with a meaningful hands-on STREAM experience, it encourages a positive impact in their dispositions and perceptions towards STREAM (Spyropoulou et al., 2020). In the teaching and learning process, teachers are the key agent in shaping and determining the quality of education and effective learning. It is

undeniable that the teachers' ability and the pedagogical approach used to promote the integration of STREAM learning will significantly impact the success of STREAM education. Besides the perspectives of in-service preschool teachers, it is equally important to investigate pre-service preschool teachers' perspectives as they will be the teachers in the future, thus, their perspectives about STREAM education should be taken into consideration as a starting point for change.

Theoretical Framework

Lev Vygotsky's Sociocultural Theory (1978)

STREAM education relies on Lev Vygotsky's sociocultural theory (1978) which underscores that learning is a social process, children's mental, language and social development that are supported through social interaction (Dennington, n.d). In general, Vygotsky believed that social and cultural features of the classroom enable children to experience the social context that could guide them in shaping their perception of the world (Baltsavia & Kyridis, 2020). Vygotsky theory also greatly emphasised collaborative learning and joint problem solving, which align with the pedagogical concept of STEM/STREAM education. STEM/STREAM education focuses on the social context as it aims to cultivate the young generation equipped with the knowledge and skills to adapt to the continuous social changes. For instance, children gain authentic learning experiences through cooperative learning and knowledge of the updated modern society's devices (Dejarnette, 2018). The figure below (see Figure 1) showed the learning components of sociocultural theory.

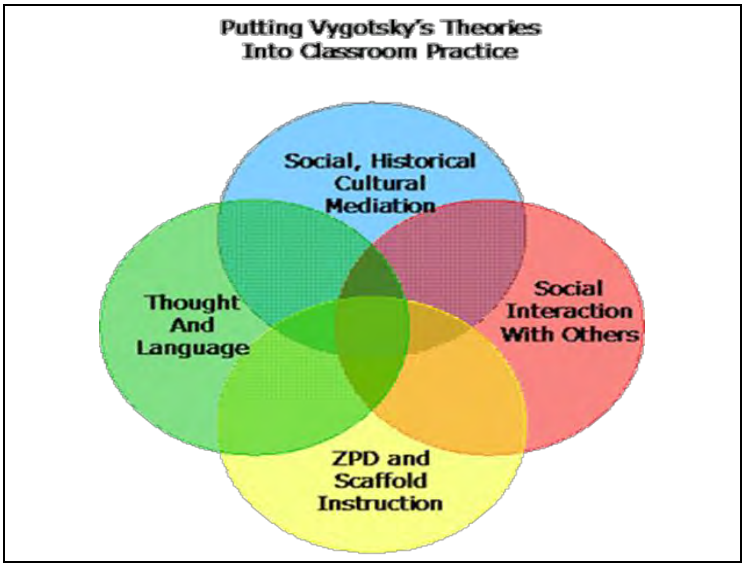

Figure 1. Vygotsky's learning components of Sociocultural theory.

Conceptual Framework of the Study

Based on the current social demands for innovation, the Malaysia STEM/STREAM education initiative is preparing the next generation to adapt dynamically to modern society with a well-structured STREAM-based curriculum. The conceptual framework (Figure 2) for this study which is an adaptation of Urie Bronfenbrenner's Ecological System Theory (1979). Urie Bronfenbrenner's ecological system theory (1970) describes human development influenced by multiple levels of the surrounding environment. He regarded the proximal processes are the everyday activities and interactions which are likely to influence the ways in which teachers think about raising and/or educating their young children. The following framework describes how the teachers' perceptions on STREAM practices are impacted by the various contexts.

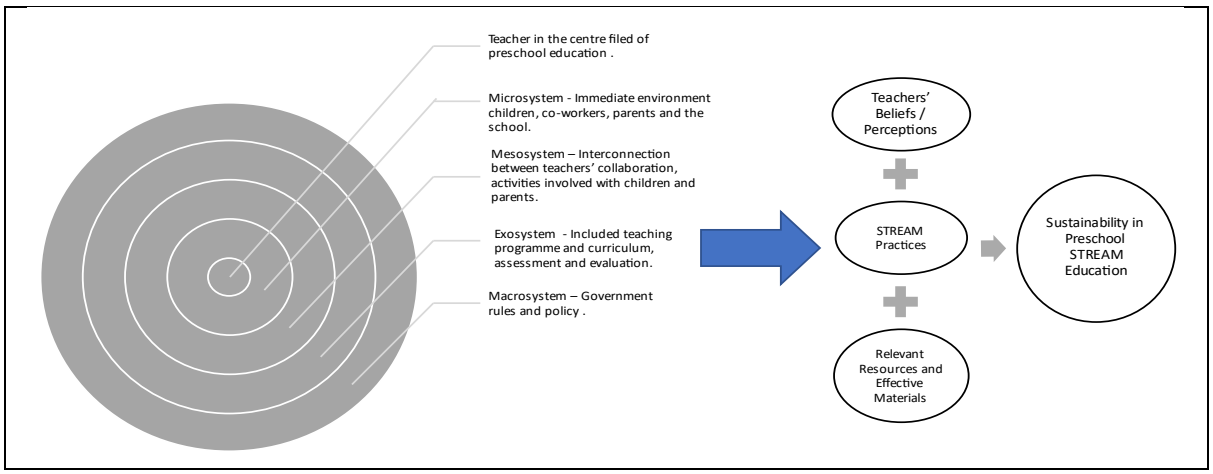

Figure 2. Conceptual Framework: The Ecological Context of a Teacher

The above conceptual framework (Figure 2) is developed to show the importance of teacher awareness that the STREAM-related activities (proximal processes) that involving the child, and that workplace, parents and families, school curriculum and programme as well as the educational policy literacy and environment which are considered as the important factors for effective practices and implementation for sustainability in preschool STREAM education (Wai Leng, 2021).

Background of STEM vs STREAM Education

Education across the world has universally emphasised on the STEM-oriented education system. The evolution of STREAM began with STEM. The acronym of STEM is formed by the first letter of Science, Technology, Engineering and Mathematics which is known as an interdisciplinary approach that aims to combine two or more STEM disciplines (Chia & Maat, 2018). However, the argument among educationists in recent years on the skills that are needed for the future sustainable development and productive society including reading, higher-order thinking skills, decision-making, communicating, creativity, and emotional skills such as social responsibility and cultural appreciation (Ayob, 2020). Accordingly, the shifting educational paradigms towards integrating "R" (Reading) in STEAM subjects is increasingly accepted and finally making it STREAM (Science, Technology, Reading, Engineering, Arts and Mathematics). According to Bacotang (2013), early literacy needs to be nurtured from the early years to enhance the literacy and reading skills among the young children. If the reading

difficulties persist in early years and this problem is not resolved, it will last and affect either the primary or secondary school education later. Therefore, the transformation of STEM to STEAM, then to STREAM was a movement among researchers and educators to enhance STREAM competency among the pre-schoolers.

STEM vs STREAM Education in Preschool Settings

Young children like to observe the things that happen in their surroundings such as observing the ant's carrying food; always show their curiosity and perpetually ask questions for the real world around them. They enjoy scribbling and creating their masterpiece; have fun in building a tower. In this regard, these innate skills are the critical tool for introducing young children to the STREAM education and support the feasibility of integrating STREAM education in early childhood institutions (Yucelyigit & Toker, 2020). Implementing developmentally appropriate STEM/STREAM education at preschool level is important to enable children to engage in inquiry-based learning, thus, establishing a quality learning experience for all the children is important (Brenneman et al. 2018). Jean Piaget's cognitivist theory highlighted those children in the preoperational stage are essential to develop their thinking capacity including the key skills for mathematical classification and scientific thinking through the interaction processes between the people and environment (Gordon & Browne, 2009).

Teachers' Perspectives towards STEM vs STREAM Education

One of the important roles of teachers is to promote STEM/STREAM education in preschool settings. The classroom practices, and instructional strategies depend on preschool teachers' prior views, attitudes and experiences. Hence, it is crucial to examine and understand teachers' perceptions about the STEM/STREAM education. Most of the research findings outlined the teachers' positive perspectives towards STEM education implementation (Cinar et al., 2016; Dejarnette, 2018; Sujarwanto et al., 2019; Ultay & Ultay, 2020). Majority of the pre-service teachers held a positive view toward STEM implementation and requested to add the STEM-related courses to the university program (Erdogan & Ciftci, 2020). Therefore, it is important to gain a clear understanding of preschool teachers' STREAM perceptions in order to sustain and establish a higher quality of preschool STREAM professional development experience. Previous studies indicated the challenges faced while implementing STEM/STREAM education was the limited high-quality teacher preparation opportunity for pre-service and in-service preschool teachers on the STEM/STREAM education approach in the early childhood years (Sawangmek, 2019). This including the lack of professional development training that can guide them properly in implementing a quality STEM/STREAM with meaningful learning experiences, as teachers having insufficient knowledge and understanding on STREAM learning areas.

Research Objectives

i. What are the preschool teachers' perceptions of implementing STREAM education in preschool settings?
ii. What are the preschool teachers' perceptions on the challenges of implementing STREAM education in preschool settings?

iii. What are the differences between pre-service and in-service teachers' perceptions of implementing STREAM education in the preschool settings?

METHODOLOGY

In this study, the quantitative research method was utilised to collect data. Quantitative data were obtained through a questionnaire survey which consists of three sections and 35 items in total. Section A is demographics information which consists of 5 items. Apart from the demographic items, the participants responded to a 4-point Likert ranging from "1" as "strongly disagree" to "4" as "Strongly agree" in section B and section C of the questionnaire. Section B consists of 25 items used for gathering preschool teachers' perspectives on the STREAM implementation in preschool settings. The items were adapted and modified from Baltsavias and Kyridis (2020) and Dejarnette (2018). Section C consists of 5 items used for seeking preschool teachers' perspectives on the challenges of STREAM implementation in preschool settings. The items were adapted and modified from Kiazai et al. (2020) and Malaysia Education Blueprint 2013-2025 (Preschool to Post-Secondary Education). The research panel's approval is obtained to use the modified instrument and to assess the validity of the adapted questions. This to help to ensure that the modified instrument is still measuring the same construct as the original.

For data analysis, Statistical Product and Social Sciences (SPSS) software was used to analyse the collected data. Data were presented in descriptive statistics and inferential statistics to address the research questions stated above. In this study, Cronbach's Alpha was used to test the questionnaire's reliability (see Table 1). The acceptable values of Cronbach's Alpha range between 0.7 to 1. Hence, the result showed the reliability coefficient .92 was found to be notably reliable in this study.

Table 1
Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.921	.934	30

Note. Cronbach's Alpha of this research study was .92 which is between 0.7 to 1 and considered as a reliable.

Participants

In this study, a purposive sampling technique was used to select participants based on specific criteria, such as whether they were in-service or pre-service teachers, that were relevant to the research questions, and with study aims to contribute insightful information to the implementation of STREAM education in Malaysia among the preschool educators. The sample size of 40 local in-service preschool teachers and 40 pre-service preschool teachers was determined to be adequate to achieve the objectives of the study, based on the available time, funding and resources. Participants were recruited through invitations sent to preschools and teacher training institutions in the selected location. Additionally, the sample was considered

as the representative of the population, given the level of homogeneity in the characteristics of the participants.

Data Analysis for 40 In-Service Teachers

Based on the data analysis, the demographic characteristics appeared that among the 40 in-service teachers, 50% are under 25 years old, 27.5% are between 26-30 years old, 15% are between 31-35 years old, and 7.5% are between 36-45 years old. In terms of qualification, 20% have an SPM level, 55% hold a Preschool Diploma in Education, and 25% are graduates of a bachelor's degree in Preschool Education. with regard of years of working experience, 12.5% of the teachers have less than one year of experience, 50% have 1-3 years of working experience, 27.5% have 4-10 years of experience, and 10% have 11-20 years of experience.

Data Analysis for 40 Pre-Service Teachers

It appears that all the pre-service teachers who participated in practicum practice are under 25 years old. Additionally, 95% of them pursued a Bachelor of Preschool Education, while the remaining pursued a Diploma in Preschool Education. The total number of respondents is 40.

RESULTS

Based on the mean score interpretation by Pimentel (2019), a detailed analysis of preschool teachers' perceptions on the implementation of STREAM education is presented in Table 2 – Table 5 with the description of the weighted mean or mean score interpretation. The following table is the new interval constructed that having a majority uniformed difference in each interval (except for one interval). This new interval with the description of the weighted mean is used for this study.

Table 2
Descriptive of the weighted mean.

Likert Scale	Interval (Mean Score)	Difference	Description (Interpretation)
1	1.00 – 1.75	0.75	Not much (strongly disagree)
2	1.76 – 2.51	0.75	A little (somehow disagree)
3	2.52 – 3.27	0.75	Some (somehow agree)
4	3.28 – 4.00	0.72	A lot (Strongly agree)

Source: Pimentel (2019)

Preschool Teachers' Perceptions for the Implementation of STREAM Education

The results in Table 3 show the preschool teachers' perceptions in terms of their roles, understanding and knowledge towards implementing STREAM education. Preschool teachers show a high level of agreement to item No. 6 "I consider that the STREAM education is appropriate to boys and girls equally." with a mean of 3.61 (SD = 0.490). The last ranking was item No. 11 "I am confident in my ability to plan and integrate STREAM in the curriculum." with a mean of 2.93 (SD = 0.689).

Table 3
Descriptive statistics of Preschool teachers' perceptions on the STREAM implementation in preschool settings, N=80

	Perceptions on the STREAM implementation	M	SD
1	I am familiar with STREAM education and related fields.	2.99	.626
2	STREAM education is an integrated learning, concerning S-Science; T-Technology; R-Reading; E-Engineering; A-Art' and M-Mathematics.	3.55	.525
3	I consider it useful for children to get acquainted with complex STREAM concepts.	3.51	.551
4	Objectives of STREAM education to enhance pre-schoolers' necessary learning skills in the 21st century.	3.59	.495
5	Objectives of STREAM education to engage pre-schoolers to have active learning.	3.59	.567
6	I consider that the STREAM education is appropriate to boys and girls equally.	3.61	.490
7	I enjoy teaching STREAM integrated topic and lessons with pre-schoolers.	3.38	.537
8	I feel comfortable with creating a student-centred environment in my classroom, in which the teacher will not completely in charge.	3.43	.546
9	I understand how STREAM can be integrated into the curriculum major content areas.	3.23	.693
10	I am knowledgeable about the strategies and resources for implementing STREAM into the curriculum.	3.04	.754
11	I am confident in my ability to plan and integrate STREAM in the curriculum.	2.93	.689
12	I am willingly looking to expand my knowledge of STREAM educational approaches.	3.55	.549
13	I consider that STREAM implementation within preschool curriculum is important for pre-schoolers' cognitive development.	3.50	.574

Note. M indicates mean; SD indicates standard deviation.

Table 4 shows that the participants mostly agree with item No. 16 "I consider important for children to be able to express their curiosity." and it ranked first with mean 3.68 (SD = 0.522). The last ranking was item No. 23 "I believe that Engineering concepts and activities are developmentally appropriate for pre-schoolers." with a mean of 3.41 (SD = 0.520).

Table 4
Descriptive statistics of Preschool Teachers' Perceptions on STREAM disciplines, N=80

	STREAM disciplines (Science, Technology, Reading, Engineering, Arts, Mathematics)	M	SD
14	I consider it is necessary for children to be able to take part in experiments and share their findings.	3.59	.520
15	I consider it is important to engage pre-schoolers in the integrated Science activities, so that they develop scientific literacy.	3.58	.497
16	I consider important for children to be able to express their curiosity.	3.68	.522
17	I consider it is necessary to integrate Technology in the modern educational curricula.	3.61	.515
18	I consider it is useful for pre-schoolers to get in touch with technology from the early years.	3.43	.591
19	I consider the use of technology as a tool for teaching and learning.	3.59	.567
20	I consider it is useful to engage pre-schoolers in Reading/Early literacy/Language arts activities that integrate with STREAM.	3.53	.595
21	I consider it is important to have inclusion of Engineering activities in the modern educational curricula.	3.45	.525
22	I consider important to engage my students in activities that require engineering thinking, so that they investigate and solve problem.	3.50	.503
23	I believe that Engineering concepts and activities are developmentally appropriate for pre-schoolers.	3.41	.520
24	I consider it is useful to engage pre-schoolers in creative arts/dance/music and movement activities that integrate with STREAM.	3.59	.495
25	The inclusion of Maths activities in STREAM will help pre-schoolers to acquire mathematics concepts (e.g.: time, measurement) and use them in their daily life.	3.58	.497

Note. M indicates mean; SD indicates standard deviation.

Table 5 shows the preschool teachers' perspectives on the challenges of STREAM implementation in preschool settings. By referring to the table below (see Table 5), item No. 2 "Lack of teachers' expertise for integrating all STREAM learning areas/ learning activities." ranked first as it has the highest mean of 3.36 (SD = 0.680). The last ranking was item No. 5 "Pre-schoolers lack of motivation towards STREAM learning areas/learning activities" with a mean of 2.94 (SD = 0.905). Generally, there are 4 items out of 5 with the mean value above 3.00.

Table 5
Descriptive Statistics of Preschool Teachers' Perspectives on Challenges to implement STREAM education in the preschool settings, N=80

	The challenges to implement STREAM education in preschool settings	M	SD
1	Lack of time to conduct STREAM integrated activities.	3.15	.731
2	Lack of teachers' expertise for integrating all STREAM learning areas/ learning activities.	3.36	.680
3	Lack of teachers' expertise in implementing STREAM activities or experiments.	3.35	638
4	Lack of opportunities for in-service and pre-service STREAM training.	3.28	.636
5	Pre-schoolers lack of motivation towards STREAM learning areas/learning activities.	2.94	.905

Note. M indicates mean; SD indicates standard deviation.

Differences between Pre-service Preschool Teachers and In-service Preschool Teachers' Perceptions on the implementation of STREAM education

The t-test analysis is appropriate to use in comparing the means of two groups and assess if the two groups are statistically different (Trochim, 2020). By referring to the p-value, also known as probability value, it is a number that describes how likely the data would have occurred and helps to decide whether the hypothesis is true (Bevans, 2020). It was mentioned that the most common p-value typically is less than 0.05 ($p \leq 0.05$) considered as statistically significant. In this segment, an independent sample t-test was conducted to compare the perceptions of pre-service teachers and in-service teachers towards STREAM implementation in the preschool settings.

Table 6 displays the results of pre-service and in-service teachers' perceptions on STREAM implementation in preschool settings. In terms of the preschool teachers' perspectives on the STREAM implementation, pre-service teachers (n = 40) had the higher mean of 86.70 (SD = 9.39) compared to the in-service teachers with the mean of 86.07 (SD = 8.52) (see Table 6). The positive p-value indicated the mean for the pre-service teachers' perspectives (M = 86.70, SD = 9.39) is significantly greater than the mean for the in-service teachers' perspectives (M = 86.07, SD = 8.52).

Table 6
Comparing pre-service and in-service preschool teachers' perceptions, N=80.

Types of preschool teachers	N	M	SD
Pre-service teachers	40	86.70	9.39
In-service teachers	40	86.07	8.52

Table 7 shows the result of pre-service and in-service preschool teachers' perceptions on STREAM implementation. Levene's test for Equity of various showed no violations, the Sig. column with the p- value of 0.55 (p = .55) (see Table 7). Results indicated that the Sig (2-tailed) value is .756 which is greater than the p value = .05. Therefore, the interpretation of these data shows that there was not a significant difference in the scores for pre-service teachers' perceptions and in-service teachers' perceptions towards STREAM implementation in the preschool settings; t (78) = 0.312, p = .756, Cohen's D = .07.

Table 7
Independent samples test of pre-service and in-service teachers' perspectives on STREAM implementation in preschool settings.

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std.Error Difference
Equal variances assumed	.361	.550	.312	78	.756	.63	2.01
Equal variances not assumed			.312	77.28	.756	.63	2.01

Note. t = t test statistic, df = degrees of freedom, Sig (2-tailed) = significance/ probability.
*p ≤ .05.

Table 8 displays the results of pre-service and in-service teachers' perceptions on the challenges of STREAM implementation in preschool settings. In terms of the preschool perceptions on the challenges of STREAM implementation, pre-service teachers (n = 40) had the higher mean of 15.50 (SD = 2.60) compared to the in-service teachers (n = 40) with the mean of 16.65 (SD = 2.43) (see Table 8). The negative p-value indicated the mean for the pre-service teachers' perspectives (M = 15.50, SD = 2.60) is significantly lesser than the mean for the in-service teachers' perspectives (M = 16.65, SD = 2.43).

Table 8
Comparing pre-service and in-service preschool teachers' perceptions on the challenges of STREAM implementation in preschool settings.

Types of preschool teachers	N	M	SD
Pre-service teachers	40	15.50	2.60
In-service teachers	40	16.65	2.43

Note. Total N = 80. N represents sample size, M represents mean, SD represents standard deviation.

Table 9 shows the differences between pre-service and in-service preschool teachers' perspectives on the challenges of STREAM implementation. Levene's test for Equity of various showed no violations, the Sig. column with the p- value of 0.976 (p = .98) (see Table 9). Results indicated that the Sig (2-tailed) value is .045 which is equal to the p value (p = .05). As stated above, the statistically significant occurs as the p-value less than 0.05. The more p-value closer to 0, the higher the significant difference between the groups. Therefore, there was statistically significant different in the scored for the perspectives of pre-service teachers (M = 15.50, SD = 2.60) and in-service teachers (M = 16.65, SD = 2.43) on the challenges of STREAM implementation; $t(78) = -2.04$, $p = .05$, Cohen's D = .45.

Table 9
Independent samples test of pre-service and in-service teachers' perspectives on the challenges of STREAM implementation in preschool settings.

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std.Error Difference
Equal variances assumed	.001	.976	-2.04	78	.045	-1.16	.563
Equal variances not assumed			-2.04	77.66	.045	-1.16	.563

Note. t = *t* test statistic, df = degrees of freedom, Sig (2-tailed) = significance/ probability.
*p ≤ .05.

DISCUSSION AND IMPLICATIONS

Preschool Teachers' Perspectives on Implementing STREAM Education in Preschool Settings

The data analysis presented in Table 3 and Table 4 reported preschool teachers' perspectives towards preschool STREAM implementation. The results (Table 3) reported the perspectives of preschool teachers on their roles, understanding and knowledge on implementing STREAM education. The overall results revealed that preschool teachers expressed their perceptions in varying levels of agreement positively. The participants in this study responded that they strongly agree and consider that STREAM education is appropriate for boys and girls. However, the result (Item 11) revealed less satisfactory level as they are somehow not fully confident for planning and integrating STREAM in the curriculum; and some of them not quite familiar with STREAM education and related or associated fields (Item No.1) that aims to offer learners with an interdisciplinary education that is skills-based, or industry-based for practical application. This finding was supported by the research study conducted by Bahrum et al. (2017) in the context of Malaysia who highlighted that Malaysian teacher have less exposure to the STEM/ STREAM education approach. Therefore, they might have heard of STEM/STREAM, but unclear with the application of the STREAM practices.

The data analysis presented in Table 4 shows preschool teachers' perspectives towards six STREAM disciplines which are Science, Technology, Reading, Engineering, Arts and Mathematics. All the responses revealed the degree of strongly agree towards the STREAM disciplines. Besides, the last ranking (Item 23, M=3.41, SD=0.52) that fall under the high degree level also revealed that teachers believe that engineering concepts and activities are developmentally appropriate for pre-schoolers. From the results, it shows that the teachers recognised that it is important for children to express their curiosity as the related item has the highest mean (M=3.68, SD=0.522) among the 25 items. It is good evidence to find out that most teachers are aware of curiosity is one of the scientific attitudes in early science that required the young children to work scientifically. Young children are curious explorers and eager to understand the world around them from the moment they were born (Akturk & Demircan, 2017; Ong et al, 2016). These innate skills correspond to the STEM/STREAM required skills which can better support and motivate children to be exposed to STREAM learning.

Preschool Teachers' Perspectives on the Challenges of STREAM Implementation in Preschool Settings

The data analysis presented in Table 5 shows the perspectives of preschool teachers towards the challenges of STREAM implementation in preschool settings. The findings revealed that the first three items with highest mean were related to the issues of lacking teachers' expertise and lack of professional development for preschool teachers in the STREAM education approach. Majority of the preschool teachers responded with a high level of agreement to the questions related to the lack of teachers' expertise, and lack of training in the STREAM education field as the challenges of implementing STREAM education in preschool settings. Preschool teachers view the lacking teachers' expertise as the most challenging issues to implement STREAM education in preschool settings. They may also struggle to practice and integrate STREAM activities in preschool settings if they lack pedagogical content knowledge (Akturk & Demircan, 2017).

Besides, some researchers also supported the results as the majority of pre-service and in-service teachers mentioned about the lack of professional development such as training to properly guide the teachers in implementing and promoting a quality STEM/STREAM learning. For instance, the finding indicated that pre-service teachers highlighted the lack of STEM/STREAM-based courses in the early childhood undergraduate program, thus, they suggested the necessary to add the related courses so that pre-service teachers can be trained in practising and implementing the STEM/STREAM curriculum by bringing these disciplines together (Ultay & Ultay, 2020).

In summary, preschool teachers are concerned most about the lack of teachers' expertise to support them in integrating and implementing STREAM learning activities. It is because they lack opportunity to participate in the STEM/STREAM-related professional development training and accordingly lack sufficient knowledge to implement STREAM lessons and learning activities in preschool classrooms. By looking into the findings, preschool teachers actually need the STREAM related training, workshops and conferences that can help them in increasing their knowledge, skills, and dispositions towards the STREAM education approach.

Differences Between Pre-service Teachers and In-service Teachers' Perceptions of Implementing STREAM Education in Preschool Settings

The results indicated that there are no significant differences between the pre-service and in-service preschool teachers' perceptions towards the preschool STREAM implementation. Two groups of participants held positive perspectives on the STREAM in terms of its' integrated learning areas and contribution to children's development and learning. The two groups of participants show their strong level of agreements on the implementation of the STREAM approach at the preschool level could bring various contributions on children's domains of developmental such as cognitive, socio-emotional skills as well as to enhance and equipped young children with the necessary learning skills in the 21st century classroom such as communication, critically thinking, creativity and collaboration, in order to work scientifically with desired science process skills and scientific attitudes.

On the other hand, this research findings revealed that there is a significant difference between in pre-service and in-service preschool teachers' perceptions on the challenges of STREAM implementation. The results revealed that in-service preschool teachers tended to have higher concerns than pre-service teachers regarding the anticipated challenges. By considering the current curriculum that is implemented in the preschool and the classroom's situation, the result indicated that in-service teachers somehow could foresee the challenges and the possibility of issues and problems for the implementation of preschool STREAM education in preschool classrooms.

CONCLUSIONS

The findings of this research revealed that majority of the preschool teachers have positive perceptions towards STREAM implementation in the preschool settings despite the anticipation and perceptions for the challenges for implementing STREAM education. It is essential to investigate preschool teachers' perceptions towards STREAM education as it influences teachers' willingness to implement this educational approach in their classrooms, as

well as how they design and carry out the integrated STREAM lessons to the pre-schoolers. However, the main challenges for preschool teachers to implement STREAM education in preschool classrooms can be categorised as the internal constraints such as teachers' comfort level and self-confidence. In a nutshell, this study provides insightful information for the policy makers and related stakeholders on the readiness and preparedness in implementing STREAM education in the current preschool settings. Suggestions for future research could investigate further on topics related to the sustainability of STREAM education practices in the preschool classrooms. Nevertheless, we should not undermine the high degree of indication for the lack of teachers' expertise for integrating and implementing STREAM activities, as well as the lack of opportunities for STREAM education which is alarming. Therefore, there is a need to provide workshops and teacher trainings, with relevant contents, effective materials, and STEM resources such as learning module which is an organised collection of content presented together using multidisciplinary approach, to support and sustain quality preschool STREAM education.

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