Designing the Integrated Thematic Preschool Stream Module

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ABSTRACT

Malaysian Blueprint (2013-2025), under Malaysian Ministry of Education (MoE) has placed great emphasis on STEM education. Currently preschool STEM education has evolved from STEAM to STREAM. STREAM is an acronym for Science, Technology, Reading, Engineering, Arts and Mathematics. However, methods of promoting STREAM are barely adapted in preschool classroom practice. There is hardly substantial research that emphasize on the design and development of STREAM module to foster STREAM at the preschool level. This requires a reliable and effective teaching and learning STREAM module that can train or guide teachers using the Integrated thematic instruction (ITI) model to address the National Philosophy of Education for developing the potential of individuals in a holistic and integrated manner. Therefore, this research paper aims to design and development of integrated thematic preschool STREAM module by using the design and development research (DDR) approach. In order to determine the instructional goal, the researchers had performed the 3 phases of study based on the DDR approach. The first phase is to investigate the needs and challenges faced by the teachers towards STREAM education using quantitative approach; the second phase is obtaining expert consensus for the main inputs of the STREAM module using Fuzzy Delphi method; the third phase is to evaluate the usability and practicality of the module using focus group interview with the experts. The overall findings provide potential for developing the Integrated thematic Instruction (ITI)-preschool STREAM module for professional development. This developed module therefore would represent a reliable and credible ITI-Preschool STREAM module for fostering preschool STREAM education nationwide in the local context.

Keywords: design and development research, thematic, integrated, preschool, STREAM module

INTRODUCTION

Understanding and integrating preschool STREAM education in Malaysia is the priority for our national education programme. It is an on-going effort towards further developing the potential of individuals in a holistic and integrated manner. It is an approach towards STREAM literacy workforce and Literate citizens under the Malaysia Blueprint (2013 – 2025).

Nowadays, the educators are always talking about STEM, STEAM, STREAM and with good reasons and the educators are navigating the process of turning STEM into STEAM, or even STREAM (Ali Trachta, 2018., Diane Kashin., 2017). It was emphasized in a written article (Child Care of Southwest Florida, 2018) that the importance of STEM is to educate and prepare children in the areas of science, technology, engineering, and mathematics. Soon after STEM, evolved STEAM – science, technology, engineering, art and mathematics. By incorporating art into the mix, this adds the design and creativity needed to look at a situation and develop a plan. This allows children to increase their technical skills but use creative ingenuity. Now let us add the newest acronym, STREAM – science, technology, reading, engineering, arts and math. This movement recognizes that reading is foundational to all early childhood education in various learning areas. Essentially, STEM, STEAM and STREAM are being implemented to ensure that young children receive a well-rounded education.

Why is STREAM gaining its popularity? STREAM is a holistic approach to education that provide opportunities for the young children to apply their learning in real life situations - learning by doing, with hands on and minds on. Why to STREAM in early childhood? STREAM pervades every part of young children's lives. STREAM helps young learners applying their knowledge and skills to real world situations. It is far beyond STEM: Integrating a multidisciplinary approach. The researcher in this study regards STREAM as the evolvement of active learning in the 21st century classroom. The evolution of STEM to STREAM education had positively impacted the related fields and disciplines immeasurably (Olalekan et.al 2020).

According to Ananya Debroy (2017), the total attention to STEM learning has been widening to new a model named STREAM. In addition to the STEM model, it includes Arts or Aesthetics; and 'Reading and Writing' concept into it. Initially it was first known as STEM, which was then updated by educator bodies into STREAM. This massive change was very important to actively promote the 21st century skills in students. To integrate 'R' (Reading and Writing) and 'A' (Arts) into STEM model is thus necessary, as it has been discovered that both areas assist in any discipline. Same mind-set as Kashin (2017), both of them believed by adding 'Reading' and 'arts' in the STEM model, it creates a multidisciplinary and holistic approach and acts as a mediator that supports cross-curricular teaching processes (Debroy, 2017). Indeed, this infusing of 'Reading & wRiting' into STEM model was important because it has been found that writing like any other art helps in teaching an entire range of tools for thinking which are required to be creative in any discipline. Thus, such an update was indeed important.

As we enter the second decade of the 21st century, we must initiate a curricular vision that meets a new spectrum of vital interests, if the 4Cs: creativity, collaboration, communication and critical thinking skills all touted as the hallmark skills for 21st century success, then preschool educators should ensure that the STEM education is drawn closer to Reading (wRiting) and Aesthetic (Arts). Reason being these skills are important for encouraging active thinking and providing opportunities for young children to develop into confident, capable learners in the modern society (Debroy, 2017).

Although studies reviewed those preschool teachers are having STREAM practices in the classrooms. However, there was still a lack of evidence on research that how preschool teachers taught STREAM lessons effectively. This paper provides insights on how STREAM effort can be achieved through using a practical STREAM module for better theory and practice. The design and development of the module would provide the overview of the Integrated Thematic Instructions (ITI) to enable preschool teachers to understand our educational policy agenda, as

well as to address our Malaysia Blueprint (2013-2025) basic goals and orientation towards quality education. Overall, the basic ITI STREAM module is designed for preschool teachers to enhance STREAM teaching practice. It is also help preschool teachers to be more ready for STREAM education. This module serves to increase the competency of teaching, including the pedagogical content knowledge (PCK) for integrated thematic content, teaching strategies and teachers' own STREAM literacy development. Furthermore, the ITI-STREAM module can be used to improve the efficacy level among the preschool teachers for effective classroom practices and to overcome the challenges highlighted in the study.

Research questions:
There are 4 research questions guiding this study:

I. To identify the need to develop the ITI-STREAM module to improve the efficacy of the preschool teachers.
II. To design and develop the ITI-STREAM module based on the model of integrated thematic instruction.
III. To validate the component and content of the ITI-STREAM Module.
IV. To evaluate the usability of the module to enhance and sustain ITI-STREAM for quality education.'

Theoretical Foundation
This is to acknowledge that the design and the development of the module should base on the analysis of various elements including the local context challenges and its implementation as well as the association of theories and approaches, as well as the relevant instructional design model (Siew & Chin, 2018).

A major fallacy about the Integrated Thematic Instruction (ITI) model is fine for the content areas especially for science and mathematics, as it does lend itself powerfully as science and mathematics are the wonderful sources for meaningful themes and skills that are usually taught in the brain-compatible classroom (Kovalik, 1994). The ITI model is designed on three interlocking, interdependent principles, which are human brain research, teaching strategies and curriculum development. Integrated Thematic Instruction (ITI) is a vehicle for bringing all these three areas as Integrated thematic instruction (ITI: The Model) together. The theme acts as a pattern for organising ideas and to enhance the pattern-seeking operation of the brain. The curriculum development and teaching strategies are selected and organised with great care to fit how the brain learns.

Figure 1 *Integrated Thematic Instruction (ITI: The Model)*
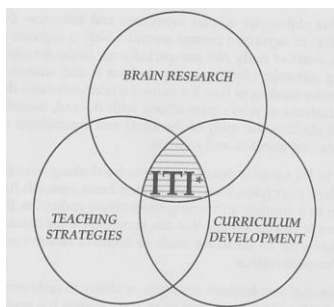
According to Susan Kovalik Associates (2003):

"*Generally, the key aspect of the ITI model includes professional development, curriculum writing, and effective instructional strategies. The model includes the proven strategies and methods for student learning, teaching, and school management. Many elements of ITI, such as collaboration, absent of threat, immediate feedback have been the subjects of countless research studies that demonstrate their effectiveness in raising academic achievement. ITI teachers arrange opportunities for learners to demonstrate their mastery before appropriate audiences and provide real-world situations for applying skills and concepts.*"

Furthermore, teacher education in Malaysia is an on-going effort towards producing teachers who are of high moral standards, who possess progressive and scientific vision, who are committed to uphold national aspirations and cultural heritage, who ensure the development of individuals, and who preserve a united, democratic, progressive, and disciplined society (Ministry of Education, 2001). The construction of the preschool ITI-STREAM module is based on the guide driven by the Preschool Curriculum Standard Document which highlights the integrated, thematic approach (KSPK, 2017), and the National Philosophy of Education (Ministry of Education, 2001) that towards the holistic and integrated manner. The educators should believe that the potentials of individuals can be developed through the process of education. These individual's potentials cover all intellectual, spiritual, emotional, and physical aspects. Holistic development by integrating all potential of individuals in such a manner will produce balanced and harmonious citizens. Following this, another important factor which could not be ignored was the influence of the development of international education system. For example, the education programmes such as democratization and globalization of education, and lifelong learning which were discussed and adopted by the UNESCO in the eighties. The influence of these international factors can be identified at the beginning of the National Philosophy of Education (MOE, 2001): "Education in Malaysia is an on-going effort", which clearly reflected the concept of lifelong education with respect to globalization of education. Hence the focus of a STEM education that related to the 21st century skills that involved in good communication, collaboration, creativity, and critical thinking is much encouraged (Malaysia Blueprint, 2013 -2025).

METHODOLOGY

Research Design

The research design of this study is using Design and Development Approach (Richey & Klein, 2014) to evaluate the objectives of this research. This present study employed type 1 the first category of DDR namely, product and tools research (Richey & Klein, 2007), as it involved designing, developing, and evaluating a product, namely an ITI-STREAM module for the preschool context. Since this study was conducted in an educational context and specifically intended to improve preschool practice through development of an educational product, therefore it could also be considered concurrently as an "educational design research" as postulated by Plomp (2007). In specific terms, this study employed DDR in an educational context for the purpose of developing a research-based intervention to address educational problems. Hence, in the context of this study, DDR was used as an "umbrella term" (Richey & Klein, 2004) that refers to the design, development, and evaluation of the ITI-STREAM module in the preschool context.

Richey and Klein (2014) noted the versatile structure of DDR which is dependable on the innovation and creativity of the researcher. On the other hand, a review of the related literature discerned a similar pattern in various DDR studies. The process of development often begins with analysis of the needs and context, moves on to the design and development stage, and finally implementation and evaluation of the intervention developed (Mohd Ridhuan & Mohd Jamil 2016., Mohd Ridhuan & Nurul Rabihah 2020). These stages may be structured differently based on the suitability to the local research context. However, the design and development of the research generally adhere to these iterative phases in working towards the developing of a practical solution to address the needs of current trends and issues in the local context.

Ethical Considerations

Permission was obtained from the participants: preschool teachers, preschool principals, and experts in the related educational field. The purpose of the research was explained, and the participants were assured for the confidentiality.

Phases of Design and Development Research (DDR)

As in a typical DDR study, this study was structured into three phases as shown in Figure 1 as below. The respective purpose for each phase was also briefly outlined. As each phase addresses distinct methods and steps involved, and it differs from one phase to another (see Table 1).

The three DDR phases are adapted in the study, namely:
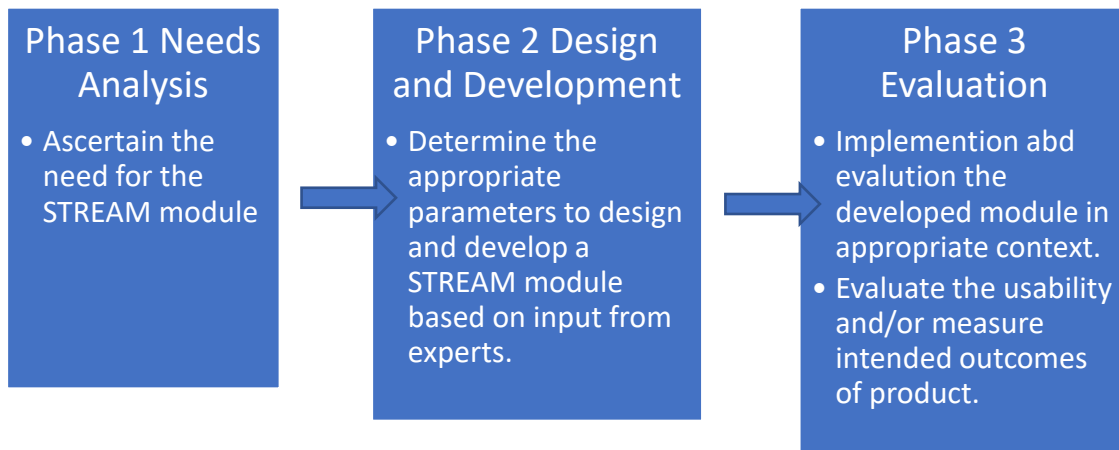Phase 1: Needs analysis
Phase 2: Designing and development
Phase 3: Evaluation.

Table 1 *Phases of development*

Phases	Participants	Methodologies	Techniques
Phase 1: Needs analysis	80 preschool teachers	Quantitative approach	Descriptive statistics -SPSS
Phase 2: Designing and development	Design: 3 experts Development:10 experts	Design: - Literature - Structure Interview Development: -DDR approach	Thematic analysis Fuzzy Delphi Technique
Phase 3: Evaluation.	6 Experts from the related preschool education	Focus group interview	Thematic analysis

Figure 2 *Phases of design and development research (DDR)*

RESEARCH FINDINGS

Phase 1: **Needs analysis.**

Objective of phase 1:

- To identify the need to develop the ITI-STREAM module to improve the efficacy of the preschool teachers.

RESULTS of the Needs Analysis

This study was using quantitative approach to investigate teachers' perceptions on challenges to implement STREAM education in the preschool settings.

In this Phase One – Needs Analysis, which is the process of identifying the needs of design and development of the module. The findings of the data revealed the information on the challenges faced bey the preschool teachers. The data was obtained by the researcher through the distributions of questionnaire.

Table 2 shows the preschool teachers' perspectives on the challenges of STREAM implementation in preschool settings. By referring to the table below (see Table 1), 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).

Table 2 *Descriptive Statistics of Preschool Teachers' Perceptions 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.

The data analysis presented in Table 3 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 lack of 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 studies supported the results as most 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 STREAM learning. For instance, the finding indicated that pre-service teachers highlighted the lack of 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 practicing and implementing the STREAM curriculum by bringing these disciplines together (Ultay & Ultay, 2020). This illuminates the need for better guidance and support for the implementation of Preschool STREAM programme.

Summary of Phase One findings

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 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 may need the STREAM related training, workshops and conferences that can help them in increasing their knowledge, skills, and dispositions towards the STREAM education approach. This study helps to determine the need analysis which was useful for the researcher to gain a comprehensive understanding in the local context and significant problems encountered in practice. In short, 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. However, it is essential to investigate preschool teachers' perceptions towards STREAM education as it reflects 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 preschoolers. However, the main challenges for preschool teachers to implement STREAM education in preschool classrooms can be categorized as the internal constraints such as teachers' comfort level and self-confidence.

The overall results revealed that there should be more training, workshops conducted, or a module should be good to enhance the teaching of STREAM. As to promote STREAM education with good foundation, the module would be designed to address the needs of the preschool teachers.

Phase 2: **Design and development**

Objectives of this phase:

- To design and develop the ITI-STREAM module based on the model of integrated thematic instruction.
- To validate the component and content of the ITI-STREAM Module.

Design

The first objective of this phase is to design the ITI-STREAM module based on the model of integrated instruction (ITI). The researcher also conducted an interview with the experts to gain opinion to construct the items of the questionnaire as well as to gain insights to design the desired module with the experts' opinions. The questionnaire was then further verified and approved by another expert in DDR.

Development

The second objective of this phase is to validate the component and content of the module based on the feedback and consensus of the experts. In the field of education, Fuzzy Delphi Method (FDM) has been adopted to obtain the experts' consensus and agreement using the quantitative approach. Selecting an appropriate panel of experts is crucial for the Delphi

technique (Mohd Ridhuan & Mohd Jamil., 2016). This strengthens and ensures the validity of the Delphi method (Mohd Ridhuan Mohd Jamil & Nurul Rabihah Mat Noh., 2020)

Ten experts who are experienced from the related educational field were invited for the participation. In this data analysis, the researcher aimed to have the threshold values $(d) < 0.2$; or at the agreement of above 75% meeting the terms of expert agreement on the items or constructs. The questionnaire containing a total of 20 items/ questions, which made of reviewers' evaluation of contents (10 items), Module activities (5 items) and evaluation of learning design (5 items) were distributed to the experts. Then the consensus from the experts were further analysed using Fuzzy Delphi Method.

During the development Phase, the ITI-Module was developed as resource pack. There are two sections in this resource pack. Section 1: Life science – consists of five (5) STREAM learning plans, and section 2: Environmental science – consists of two (2) STREAM learning plans. In total there are seven (7) STREAM learning plans provided in this resource pack. The preschool teachers may adopt and modify the activities to cater the difference needs and intelligences of the young children for classroom practices. The developed resource pack also provide the foundation of professional knowledge on domains of development, scientific attitudes, science process skills teaching strategies that enable preschool teachers to see a bigger picture of effective practices for the mastery of concepts and thinking skills needed in the 21st century classroom to promoter preschool STREAM education.

Results of Design and Development

Based on the literature review of theoretical foundation and structured interview with the identified experts, the modules design, topics were established. This phase involved the design and development of the module. To involve the experts is to identify the design of the module to be developed. The module was developed according to the consensus of the experts, based on the result of the experts' consensus and agreement from answers obtained from interviews as well as those answers from questionnaires. The data analysis was done using thematic framework for semi-structured interview. The data analysis for answers obtained from questionnaire were analyzed using Fuzzy Delphi technique to answer those research questions, which determined the design and development of the STREAM module. Experts' consensus on the design and development are crucial in this phase. The following are the research objectives and research questions for Phase Two: Module design and development.

Structured Interview

The design of this Phase Two study is using mixed methods, which is the type of research that a researcher combines the elements of qualitative and quantitative research approaches. The structured interview as a qualitative research method which combine with the quantitative approach with questionnaire were used in this single study for deeper user insights. The structured interview was done for data collection based on the questions that set within the pre-determined thematic framework to gain more insights for the design and development. In fact, this pre-determined set of open questions that are able to prompt discussion, thus provided the opportunity for the interviewer to explore particular themes or responses further.

The researcher conducted individual structured interviews to gain more insightful information from the experts. The following themes and results collected revealed the design criteria.

Theme 1: The needs of the STREAM module for preschool teachers.

(i) A relevant STREAM module for preschool education will be helpful to enhance STREAM Education

(ii)Lack of understanding the basic elements of STREAM education using integrated approach.

(iii)Lack of knowledge to conduct STREAM activities

(iv)Lack of guidance to conduct STREAM activity.

Theme 2: Criteria for effective Preschool STREAM Module.

(i)Teaching materials are easy to find

(ii)Used simple language

(iii)Able to motivate children's learning - bring fun and arouse curiosity

(iv)Learning activities are easy to conduct

(v)Consists of steps/procedures of activities

(vi)Consists of illustration/pictures of the procedures and activities.

Theme 3: Preference on teaching strategies and learning topics.

Preferred topic : Life Science and environmental science experiences/education

Teaching strategies: (1)Integrated approach, (2)Thematic approach, (3) Play-based approach

(5) Inquiry-based approach

Based on the interview results, the 7-Likert scale questionnaire was then produced based on the expert views and consensus for the module design and development. And this questionnaire was duly verified and approved by another independent expert who is not involved in the module design and development.

This ITI-STREAM module complements the implementation of the National Preschool Curriculum Standard (NPCS) as it provides concrete guidelines as a reference for teachers in facilitating preschoolers toward achieving the learning standard through hands-on early science activities. Furthermore, information provided in the ITI-STREAM module and its suggested activities support teachers in terms of pedagogical content, as well as the scientific content knowledge. This is a specific designed of an instructional tool on STREAM, early science, and it is believed that this module would be the effective platform, make easy ways for preschool teachers to incorporate and enhance STREAM education for classroom practices. The design of the initial module was followed by the development of the module prototype, which involved a thorough review of the initial module. The thorough review of the ITI-STREAM module allowed the researcher to make appropriate amendments on the module content according to reviewers. Feedbacks prior to its implementation. The thorough review process had helped to

improve the overall design and content of the ITI-STREAM module had helped the expected outcomes achieved more effectively.

Overall results /Analysis of Expert Consensus on Design and Development

The following are the expert consensus percentage for the summary of the overall items constructed for the design and development of the STREAM module.

Table 3.1 *Expert Consensus Percentage on Module Content*

Module Content	Items									
	1	2	3	4	5	6	7	8	9	10
No. of Item d ≤ 0.2	9	9	8	9	8	10	10	8	9	9
Percentage of each Item d ≤ 0.2	90%	90%	80%	90%	80%	100%	100%	80%	90%	90%
Total Item d ≤ 0.2	89									
Overall percentage Item d ≤ 0.2	89%									

Note. The above showed the total percentage of accepted items are 94%. It had fulfilled the condition as : Percentage of experts Consensus > 75%.

Table 3.2 *Expert Consensus Percentage on Teaching Strategies / Module Activities*

Teaching Strategies / Module Activities	Items				
	1	2	3	4	5
No. of Item d ≤ 0.2	9	10	9	10	9
Percentage of each Item d ≤ 0.2	90%	100%	90%	100%	90%
Total Item d ≤ 0.2	47				
Overall percentage Item d ≤ 0.2	94%				

Note. The above Table showed the total percentage of accepted items are 94%. It had fulfilled the condition as : Percentage of experts Consensus > 75%.

Summary of overall Phase 2 findings

From the findings, it showed that the participants being interviewed appear to endorse the importance of having good criteria for the design and development of ITI-STREAM module. The Preschool ITI-STREAM which is regarded as the resource pack then being developed based on the criteria set on Theme 1: The needs of the STREAM module for preschool teachers; Theme 2: Criteria for effective Preschool STREAM Module; and Theme 3: Preference on teaching strategies and learning topics. The physical Preschool ITI-STREAM Module was then presented to the experts for further evaluation on the design and development using the Fuzzy Delphi method.

Table 3.3 *Expert Consensus Percentage on Design and Evaluation*

Module Design and Evaluation	Items				
	1	**2**	**3**	**4**	**5**
No. of Item d ≤ 0.2	**9**	**9**	**9**	**9**	**8**
Percentage of each Item d ≤ 0.2	**90%**	**90%**	**90%**	**90%**	**80%**
Total Item d ≤ 0.2	**44**				
Overall percentage Item d ≤ 0.2	**88%**				

Note. The above Table shows the total percentage of accepted items are 89%. It had fulfilled the condition as : Percentage of experts Consensus > 75%.

Pertaining to the threshold value (d), expert consensus percentage, defuzzification and item position sequencing for the above items are all shown in Table 3.1, Table 3.2, and Table 3.3 respectively. From the data analysis and findings using the fuzzy Delphi technique, the researcher had identified all the items agreed by the experts. The total 20 items are achieved with percentage of experts' consensus > 75%. This means the overall design and development of preschool ITI-STREAM module is duly accepted and agreed by the experts. This study was conducted to develop the module for preschool teachers. The module developed contained the key components and elements that have been agreed by the experts that are involved in the field of early childhood education. The Fuzzy Delphi technique is used by the research as a tool to validate the design and development of the module.

Phase 3: Evaluation

Objective of phase 3:

- To evaluate the usability of the module to enhance and sustain ITI-STREAM for quality
  education.

Findings of Evaluation

In this evaluation phase, the technique of the training of trainers (ToT) 2-day-workshop, and focused group interview were employed for the usability of the module. The purpose of the workshop was to build a pool of competent instructors who can teach the materials to other people, to present information effectively, and able to lead activities that are able to reinforce learning. The participants watched the teaching and delivery of STREAM module and activites for exercise of professional development and best practices. Upon completion, during the sharing session, the participants had teaching demonstration and presentation to other participants. It is important for the participants to acquire the skills and knowledge for subject expert expertise, as well as the knowledge of instructional expertise or knowledge transfer to others. The overall results revealed the acceptance of the module. The experts agreed on the aspects of using the module as well as the pedagogical aspects of the module with suggestions to improve on fond size of certain sections and using bilingual including the national language to promote STREAM education.

Table 4 *This focused group interview results are revealed as follows.*

ASPECT OF USING THE MODULE	
1. Do you like the learning pattern using this STREAM Module?	*" The learning pattern of module is simple and attractive with a coherent whole of learning activities."* *"Simple yet concrete with method of learning including visual diagrams and pictures that make it easy to understand how it works...."*
2. Do you feel that learning using this Module fits the integrated thematic learning?	*"This module definitely can fit in the integrated thematic learning as it helps teachers to understand better what are the learning areas that involved."* *"Educator should master integrated thematic approach , then only they can plan and carry out STREAM activities.* *"Integrated thematic approach is the prerequisites for basic knowledge and foundation to enhance STREAM"*
3. Is learning this way suitable for your understanding of preschool STREAM education?	*"This module is easy to understand, suitable for teaching and promote fun learning."* *"It is suitable appropriate for teaching and learning."*
4. Is the technological aspects/application and implementation appropriate for young learners?	*"The technological aspects / application and implementation is appropriate for teachers to apply in teaching and learning."* *"Relevant video clips and integration of technology aspects are taken into consideration."* *"Good choice and acceptable songs and stories to promote STREAM integration learning."*
5. Do you find it fun for children to learn using this Module? Why?	*"Children will find the activities fun and enjoyable"* *"The chosen theme such as giraffe, butterfly and polar bear will arouse interest and curiosity."*

6. Does this STREAM Module stimulate you to think and generate more ideas to promote learning?	*"Yes, the developed module will be able to generate more ideas based on the activities provided."* *"Able to help teachers to extend and generate more ideas for to promote higher order thinking skills among the young children."* *"Scaffold them for further design-based activity."* *"The environmental education and activities can help to inculcate the importance of conservation of the environment."*
7. What are the weaknesses that you can detect while using this Module?	*" However, the module is written in English, it is better to have translation into National language – Bahasa Melayu as for the benefits of all levels of teachers."* *"Prefer to have bigger fond size for easier reading, for example the excerpts."*
8. What are the strengths of this module that can be shared together?	*"There are strengths of this module as it is colourful and looks interesting with the illustrations and diagrams, simple and easy to follow."* *"Colourful module, and well-presented overall."*
PEDAGOGICAL ASPECT OF MODULE	
9. Can this model stimulate active learning?	*"This module is able to help teachers to go beyond and generate more ideas to promote creativity."* *"Further extension can be made such as teaching measurement, height of giraffe, the mother and the young."*
10. Is that possible to promote learning through play, inquiries-based learning among young learners when using this module?	*"Yes, teachers can make use of the suggested activities to promote learning through play, and inquiry-based learning to promote thinking."* *"The role of the teachers in early children is stimulate learning through play and make learning fun."*
11. What is your view on learning activities that are applied in this module?	*"Acceptable and achievable learning activities."* *"Clear steps and procedures."* *"Teachers can learn through this module."*
12. What do you think about the activity of finding information in this module?	*"These activities are considered motivated, can be served as guide for new teachers."* *"Interesting activities and good to use as these are STREAM integrated activities.*
13. What do you think about the learning material recommended in this module?	*"Relevant suggested learning materials with good illustration."*
14. Do you agree on the content of the module – objectives, activities,	*"Agree on the content of the module, design and development that including objectives, procedures and activities,*

materials, scientific attitudes, science process skills, and recommended questions?	*recommended materials, scientific attitudes, science process skills.*
15. Do you think the design and development of this module able to maximise learning in STREAM?	*"All together 35 integrated thematic activities with specific theme provided. Good and believe it would maximise learning and achieve learning objectives."* *" Good to use thematic mapping to stimulate ideas to maximise learning…"*

DISCUSSION AND IMPLICATION

This research aims to design and develop a ITI-STREAM module and evaluate the usability of the module by experts. The overall results receive high acceptance, with some revision needs to be made to improve on presentation in terms of fonds size. Suggestion was given to incorporate with national language to make it a bilingual module for the benefits of new teachers and pre-service teachers to enhance ITI-STREAM approach, and foster STREAM education in the preschool settings. The mapping and suggested activites in the module will help teachers to generate more ideas based on their prior scientific skills and knowledge. This module can be further improved or upgraded by including more activities to arouse curiosity and interest of the young children as foundation to strengthen the integrated thematic instruction for preschool STREAM education.

Teaching STREAM literacy should be considered as part of the curriculum and pedagogy, and the culmination of passion and dedication to make our Malaysia Education Blueprint (2013-2025) feasible and possible. This study signifies the steps of needs analysis, design and development, and evaluation to produce comprehensive resource pack or resource toolkit which is aligned with the National preschool curriculum standard to promote Preschool STREAM education. The ITI-STREAM module (resource pack) can be served as the classroom instructions and materials which will provide the preschool teachers with guidance for fulfilling the needs of the nation in preparing preschool STREAM education of international standard for the present and future generations. 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. 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. In short, there is a need to provide supportive empirically validated resources and effective materials to sustain Preschool STREAM education as a frame of mind for effective implementation and desired learning outcomes.

CONCLUSION

This study examined the design and development of module. Designing a new instructional module is not a simple and easy task. While developing this ITI-STREAM module, each phase of DDR was carefully reviewed in order to obtain relevant data with logical flow. The related instruments were established through intensive interviews and discussions with related filed experts consent and approval. In conclusion, A detailed evaluation demonstrated that this

preschool ITI-STREAM module is helpful in improving the competencies of the preschool teachers.

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