

Enhancing Preschoolers' Creativity through Creative Play-STEAM Activities in Malaysia

Ying Qin Tee¹⁾

Sultan Idris Education University

Abstract

Creativity and science are perceived by many as separate entities. Could early science integrated as STEAM be used as a means for creativity development in the preschool context? This study explores an implementation of the creative play approach through integration of early science and creativity in the Malaysian preschool context, as well as its effects and impact towards young children through qualitative and quantitative means. Children's levels of creativity following the implementation were measured using Torrance's Thinking Creatively in Action and Movement (TCAM) instrument. Findings of ANCOVA revealed significant difference between the overall creativity scores of preschoolers in experimental and control groups, $F(1,53) = 5.23, p = 0.03, \eta^2 = 0.09$. Qualitative data also indicated that the activities were effective in promoting creative traits and processes among preschoolers. A creative play SEA model implemented in this study is postulated as a point of reference to further promote the implementation of creative play in enhancing creativity among preschoolers. Developing creativity purposefully through creative play should be vigorously advocated in practice as well as future research studies to anchor the field of early childhood education in line with global needs in preparation for future challenges.

Keywords : creativity, preschool, creative play, STEAM

Corresponding author, ¹⁾ teeyinqin@fpm.upsi.edu.my

Introduction

Creativity is recognised as one of the key skills required to meet emerging needs of the future (World Economic Forum, 2020). In the context of education, it is regarded as a significant 21st century skill that should be acquired by all students from preschool through tertiary levels. Can creativity be developed and taught as early as the preschool level? How can it be integrated effectively among the youngest of children?

Children who are not consistently prompted to think creatively in preschools will less likely grow up to be creative and innovative leaders in the future. Similarly, review of the available literature suggested that children today lack creative abilities (e.g., Kim, 2011; Miller & Almon, 2009), yet how creativity could be developed through play among preschoolers has rarely been studied in the Malaysian context.

This is supported by personal experiences with Malaysian preschool children which indicated that they are less capable of formulating creative ideas and playing creatively. They have difficulties generating novel ideas and tend to adhere to a standard set of conformed ideas as they are acclimatized to closed-ended questions with fixed answers.

Young children, in the context of early childhood education are innately curious about the world around them. This disposition should be taken as opportunity by educators to arouse a lifelong interest, passion, and motivation in understanding the world around them from a young age. Teaching and learning of science in the early childhood years if delivered effectively, is expected to nurture new generations who are capable to devise solutions for a range of socio-scientific issues affecting the world.

In addition, children's development should be viewed holistically across all developmental domains. In light of this, early science should be delivered as a multidisciplinary, integrated area instead of a standalone subject in order to be an effective platform to develop holistic children who are well-balanced in all developmental areas. Even with the recent emphasis on Science, Technology, Engineering, Art, and Mathematics (STEAM) in the field of early childhood education across the globe, early science remains merely as just another standalone subject in many preschools. This indicates that children around many corners of the world, including developing countries such as Malaysia still do not acquire effective early science instruction through integrated, first-hand, active, fun, and sensorial play experiences. This

could pose a serious risk to young children's development, leading to adverse effects towards the global human capital development in the long term, where the working population are incapable and unequipped to face the challenges posed by the constantly evolving technologies.

Moreover, science and creativity are perceived by many as dichotomous areas, which contradicts with Cremin et al. (2015) who highlighted the similar nature of both early science and creativity as "exploratory and investigative" (p.406). Science is also commonly depicted as rigid, hardly creative, and objective in nature compared to the arts. Nevertheless, early science is an important medium to develop young children's creativity, aside from other skills including problem-solving and language competencies (Daud et al., 2011; Nilsson, 2015; Mirzaie et al., 2009; Nachiappan et al., 2018). A paradigmatic shift in teaching early science and mathematics should occur, whereby the main focus is no longer on knowledge per se but on the development of innovative and creative thinking in tandem with the needs of the 21st century (Glauert & Manches, 2012; Hunter-Doniger, 2016).

Considering the arts should not be the sole medium to foster creativity in early childhood education, this study aims to explore the development of creativity among Malaysian preschoolers through the implementation of creative play integrated into early science. Based on STEAM activities and its association with science process skills as well as creativity (Phang et al., 2020), effects and impact of creative play on preschoolers' creativity were explored and examined.

Literature Review

Early childhood education in Malaysia

Malaysia has seen a steady growth in population in the last 10 years. However, it is expected that the effects of aging population will begin to emerge in the coming decades. Therefore, Rabi et al. (2020) has strongly established the need for long-term public investment in the field of early childhood education as a means to achieve better economic development in terms of stability, leading to a prosperous and fair society for all.

The current early childhood education in Malaysia could be generally divided into two broad categories, nurseries, or childcare centres (TASKA) for children under the age of four, and preschools (TADIKAs) for children within the age range of four to six. This paper specifically focuses on the latter. Statistics by the Malaysian Ministry of Education (2019) indicated that 56.96% of the overall national percentage of preschool providers are private, while 43.04% are public preschool classes. Regardless of its type, it is mandatory for all preschool settings to adhere to the national preschool curriculum, i.e., the National Preschool Standard-based Curriculum (NPSC). The curriculum aims to develop preschoolers' potential in a comprehensive way across all developmental aspects including physical, spiritual, social, and intellectual aspects through implementation of "fun, creative and meaningful activities" (Ministry of Education, 2017, p. 2). The most recent revision of the NPSC also established creative thinking as one of the higher order thinking skills (HOTS) and 21st century skills that should be developed among preschoolers (Ministry of Education, 2017).

Preschool enrolment in Malaysia is not compulsory until the formal school entry age at seven. Nevertheless, the nation is working towards universal access and enrolment for all levels including early education according to the Malaysian Education Blueprint 2013-2025 (Ministry of Education, 2013). The most recent statistics indicated that Malaysian preschool enrolment rate for the five- and six-year-olds in 2020 stood at 83.5%, compared to 77% as of June 2011 (Ministry of Education, 2013; Ministry of Education, 2021). It is important to note that due to the pandemic, preschool enrolment rates have seen a decrease from 90.97% in 2019 to 90.18% in 2020 for the six-year-olds; whereas decrease for five-year-olds is more apparent from 80.67% to 76.65% (Ministry of Education, 2021). Nevertheless, the overall trend of the Malaysian preschool enrolment rate shows a steady increase from 2010.

In preparation for the challenges in the coming era, the quality of preschool education should be constantly improvised to ensure that children gain utmost benefit at the key stage of their lives, in order to build a strong human capital for the nation in the near future. Various initiatives and effort have been planned and implemented to further improve early childhood education in Malaysia. The competence of preschool teachers without adequate training in implementing developmentally appropriate practice for children's optimal development is largely questionable. Hence, the government has approved that the qualification of all preschool teachers to be a minimum of Diploma level by 2020 (Ministry of Education, 2019).

With a higher level of minimum qualification for preschool teachers, it is envisioned that all young children in Malaysia will have access to early childhood education with a better quality.

Statistics indicated that in 2017, 44.4% of Malaysian preschool teachers possess at least a Diploma in Early Childhood Education (Ministry of Education, 2018). However, the percentage has dropped drastically to 25.05% in 2018. It is notable that 99.78% of preschool teachers from the private sector do not possess the minimum academic qualification (Ministry of Education, 2019). In addition to issues surrounding preschool teachers' qualification, other challenges and issues in the Malaysian early childhood education include curriculum orientation, teacher competence and training, environmental background of children, as well as family and community partnerships (Qin & Nor, 2018; Rahmatullah et al., 2021). Upon comparing the management of Malaysian private and government preschool centres, Hamid et al. (2020) postulated significant differences between both, with the latter having more qualified and experienced staff. This is in line with findings from Foong et al. (2018) that highlighted that a significant number of teachers in the Malaysian private preschools are young, poorly paid, and generally lack experience and qualification. Similarly, Aziz et al. (2021) also pointed out that remuneration offered to teachers in the field often does not reflect their job natures and qualifications.

In terms of curriculum implementation, formal and teacher-directed approaches are still largely in use especially in private preschools (Qin & Nor, 2018), as opposed to requirements established in the national curriculum and developmentally appropriate practice (DAP). Considering multifaceted issues in the Malaysian early childhood education, this study represents an earnest attempt towards the realignment of curriculum and its implementation in line with current and future needs. Much more should be done as a nation to further revamp early childhood education to achieve substantial benefits towards the society and nation in the long term.

Creative play approach

Underpinned by the basis of play as the nature of young children, Tee et al. (2017) proposed that the creative play approach is an integration of play and creativity to ensure that young children are provided with opportunities to develop their creativity as they involve in

play activities, as opposed to structured, teacher-directed play with little room for creative development.

Limited opportunities for creative play in preschools have deprived Malaysian children of developing their potential to think “outside the box”. Malaysia ranked 39th out of the 44 countries assessed in terms of creative problem-solving among 15-year-olds in the Program for International Student Assessment (PISA) (Organisation for Economic Co-operation and Development, 2012). Moreover, pertaining to science achievement, most recent results of the Trends in International Mathematics and Science Study (TIMSS) indicated that Malaysian students were placed at the 29th out of 39 participating countries (Mullis et al., 2020). Limited focus on creative development in Malaysia from the preschool level might be a possible reason behind its unsatisfactory ranking. These below-average findings should compel the intentional development of Malaysian students’ creativity as early as the preschool years through creative play approach.

As early science allows myriad of opportunities for discovery and creative development among young children, creative play is implemented through early science activities in the context of this study, focusing specifically on the goal of promoting preschoolers’ creativity. It is implemented in the form of six different play activities that are STEAM integrated. The activities were based on two different topics in early science, namely 1) sink and float, and 2) magnets. All six activities share seven common core features as shown in Figure 1, with a common goal to stimulate children’s creative development.

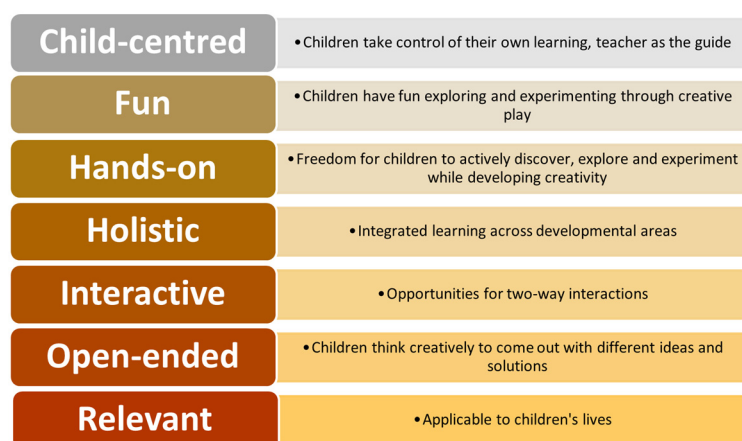


Figure 1. Seven core features of the creative play activities implemented

A brief description of the creative play-STEAM activities is as shown in Table 1. The steps to each activity were designed and implemented based on a three-stage SEA cycle illustrated in Figure 2 to intentionally elicit creativity among preschoolers during the creative teaching and learning process. The first stage “stimulate” involves provoking and stimulating preschoolers’ interest through establishing an appropriate environment. In the next stage “explore”, preschoolers are led into deeper explorations through structured and unstructured hands-on activities. In the final stage “apply”, teachers play key roles in facilitating preschoolers to extend and apply their understanding, skills and knowledge in their daily lives. Coupled by relevant open-ended questions, teachers could better provoke preschoolers to formulate ideas and enhance the development of creativity of preschoolers throughout the entire creative play process.

Table 1. *Description of Creative Play-STEAM Activities*

Creative Play Activity	Description
Sink & Float: Introduction	Applying science process skills, preschoolers hunt for things around the classroom, predict whether they sink or float, then test whether their predictions are right.
Does Clay Sink or Float?	Preschoolers explore and experiment by formulating ideas about how to make clay float on water. The activity integrates science, technology, engineering, and mathematical components.
Making a Boat from Recyclables	Preschoolers apply science, technology, engineering, arts, and mathematical principles to design a boat using various tools and recyclable items, followed by an interclass boat race.
Magnet Maze	Introduction and classification of magnetic and non-magnetic objects, completing a maze using magnets; which encompass problem-solving and mathematical skills.
Magnetic Art	Integration of the arts through producing art using magnets based on scientific principles of magnetic attraction.
Magnetic Car Race	Preschoolers explore how to make a toy car move with magnets followed by an interclass magnetic car race. Elements of science, technology, engineering, and mathematics are integrated in the process.

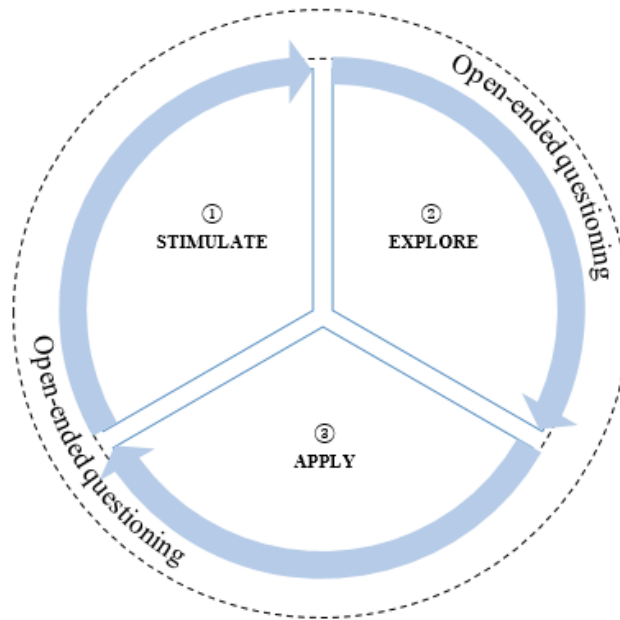


Figure 2. Three-stage SEA cycle

Method

Both qualitative and quantitative data were collected in this study. Qualitative data focused on the process of creativity development among children during the implementation of creative play. Whereas quantitative data measured the outcome of the creative play activities through a quasi-experiment.

A selected private preschool in Kuala Lumpur, Malaysia was selected as the implementation site with involvement of two teachers and 29 six-year-old preschoolers in a total of all six creative play-STEAM activities as tabulated in Table 1. Prior to the implementation process, participation consent was gained from the setting, teachers who were the key implementors, as well as parents of the participating preschoolers. An orientation session was then held with the teachers to introduce the creative play approach and the details of its implementation. After being equipped with adequate information about its implementation process, they implemented the activities with their respective six-year-old

preschoolers over the span of three weeks. Time range for each activity was 30 to 45 minutes.

During the implementation, observations were conducted to gather first-hand qualitative data at the actual preschool setting to explore how creative play enhances preschoolers' creativity. After the implementation of all six creative play activities, an on-site group interview with the two teachers involved were also conducted as an additional method for triangulation. This allowed the acquisition of richer data as perspectives and observations of teachers as implementers of the activities could be used as a complementary yet essential data source in addition to observations. Data collected from observations and interviews collectively formed the pool of qualitative data in exploring how the creative play-STEAM activities helped enhance preschoolers' creativity.

In addition, quantitative data was collected to obtain empirical evidence on the impact of creative play in achieving its intended outcome, which was to enhance preschoolers' creativity. It acted as a support to the qualitative data gathered in exploring the effects of creative play on preschooler's creativity.

A non-equivalent two-group pretest-posttest quasi-experimental design was employed to minimise disruption of the existing learning process in both preschool settings. One-way ANCOVA with a total of 56 preschoolers ($n = 56$) was conducted in order to ascertain whether there is any significant difference in the posttest creativity scores among preschoolers between the control ($n = 27$) and experimental group ($n = 29$), after controlling for differences between both groups in the pretest scores.

Pretest was individually administered to all preschoolers in both experimental and control groups. Through a three-week intervention period, the intervention group engaged in creative play-STEAM activities, whereas the comparison group received early science instruction through traditional teacher-structured, direct instruction approach with minimal opportunity for hands-on explorations. Thereafter, post-test was again individually administered to all preschoolers in both groups to assess their creativity levels.

Instrument for creativity measurement

Creative development among children was measured by Torrance's Thinking Creatively in Action and Movement (TCAM) (1981, 2000) in three different dimensions:

- (1) Fluency – the ability to generate many different ideas
- (2) Originality – the ability to generate new, original ideas
- (3) Imagination – the ability to exercise imaginative thinking to produce ideas and solve problems

Scores for each dimension were allocated according to the TCAM Scoring Manual (Torrance, 1981).

Among other creativity tests, TCAM was selected to measure young children's creativity considering their limited abilities in eliciting verbal, written, or even pictorial responses. It was specifically developed to be administered to young children from three to eight years old. It is developmentally appropriate as it employs preschoolers' kinaesthetic modality to evoke their creative expressions through physical movements which are familiar and applicable among young children. Some advantages of TCAM include few and easily accessible materials, and considerably short time to administer. Table 2 outlines the activities included in TCAM (Torrance, 1981).

Table 2. *Description of Activities Included in Torrance's Thinking Creativity in Action and Movement (Torrance, 1981)*

No	Name of activity	Description	Dimension(s) of assessment	Materials required
1	How Many Ways?	Child is required to move across the room in as many ways as possible.	Fluency Originality	Red and yellow tapes
2	Can You Move Like?	Child imagines and pretends to be: an animal or object (tree, rabbit, fish, and snake) based on four situations playing a role related to objects (driving a car and pushing an elephant off a desired object)	Imagination	None
3	What Other Ways?	Child devises and demonstrates different ways to put a paper cup into a wastepaper basket.	Fluency Originality	Paper cups Wastepaper basket
4	What Might It Be?	Child formulates alternate uses for a paper cup (e.g. a hat)	Fluency Originality	Paper cups

Prior to its administration, reliability of TCAM was measured in a preliminary study of test-retest reliability. Subsequently, a Pearson's correlation was computed to assess test-retest reliability of the overall creativity scores obtained, $r(30) = .80$. Exceeding the cut-off point

of .70 (Leech et al., 2011), this indicates high correlation of the two sets of scores. The specific reliability coefficients for each of the four activities were: Activity 1 = .46; Activity 2 = .71; Activity 3 = .29; and Activity 4 = .64. Although Activity 2 had a correlation score which showed satisfactory reliability, Torrance (1981) contended that the overall reliability score should be the focus, as young children's responses in each activity of the instrument may fluctuate and vary.

Despite TCAM being an established and validated instrument to measure creativity, a test of discriminant validity was also performed as preliminary findings. The correlation coefficients between Activity 1 and other activities are tabulated in Table 3. In terms of discriminant validity, all four activities are considered valid as the inter-correlation between activities are less than the benchmark of .85 (Garson, 2016). Therefore, both the reliability and validity findings showed that TCAM is appropriate to be employed in this study.

Table 3. *Discriminant Validity Findings for TCAM*

Pearson correlation, r	Activity 2	Activity 3	Activity 4
Activity 1	.73*	.66*	.34

* $p < .01$

To ensure authenticity of evaluation and optimal performance of preschoolers, several guidelines of administering the test were adhered to as proposed by Torrance (1981):

- Tests were individually administered
- No specific time limit with a normal range of 15-30 minutes
- Testing room should not restrict preschoolers' movement
- Examiner should be informal, spontaneous, and enthusiastic to effectively elicit preschoolers' creative responses
- Preschoolers were given sufficient time for warm-up and motivation

Results

This section outlines the qualitative and quantitative findings in exploring how and to what extent creative play-STEAM activities contribute towards enhancing preschoolers' creative

development in the Malaysian context.

Qualitative findings

Three themes were derived from the qualitative data collected through observations and interviews, namely: 1) hands-on exploration, 2) formulation of ideas, and 3) interactive partnership. Each theme pointed out how the creative play activities contributed positively to preschoolers' creativity. In addition, areas of weakness or concern were also identified concurrently to further explore the practicality of its implementation in actual preschool settings.

Hands-on exploration

The creative play approach implemented has provided ample opportunities for first-hand exploration and experimentation among preschoolers. This presents a stark contrast with the conventional approach where preschoolers are required to complete their workbooks on a topic with limited chances to experiment with real objects.

Through the activities, preschoolers were given time and opportunity to explore and apply what they have learned in multidimensional ways. After learning about the concept behind the terms sink and float, they explored and experimented with things that could possibly sink or float in various ways. This experience was further extended by an activity of constructing a boat using recyclable materials. In order to make a boat that floats, preschoolers need to have adequate knowledge on the content area to be able to apply the principles they have learned. Some of the factors to consider include the type of materials used to make the boat sturdy and waterproof, size and structure of the boat and the weight it could hold.

Authentic and engaging explorations would involve trial and errors with different ways of experimenting. Despite the activities being a new experience to the preschoolers, data revealed a variety of novel ways that they used in their explorations. When experimenting whether certain objects sink or float, the preschoolers attempted different ways to explore with the materials provided. While working with the magnets, several children did not only use the magnets with the materials provided to determine if the items were magnetic. They further explored with familiar things around them. It was also interesting to note how child

D explored with a bar magnet and a round magnet. He placed the round magnet on the floor facing up, and tried to move his bar magnet around in circular motions. The round magnet spun around as a result of the magnetic field in between. Child D was observing and investigating the cause-and-effect of his actions by exploring with magnets of different shapes and sizes.

The various strategies preschoolers devised to interact and explore with the materials provided and the environment around them illuminated heightened interest and motivation in exploring the world around them through the creative play activities. Preschoolers' interest was most clearly revealed through their body language and responses as they explored. Their verbal and non-verbal expressions revealed their experiences of pure joy and simple sense of wonder as they engaged in the activities. Excerpts from observations explicitly illustrated their excitement about what they have discovered through their hands-on exploration.

During the activity of exploring with clay, the preschoolers responded in excitement when they found that pieces of clay could float on water. When child J found a big rectangle metal container, he put his magnet near it and found that they attracted together. He immediately took it to show his teacher, saying: "See!" after overturning and holding it high (ACT4A: 28-30). In another instance, it was the preschoolers' first lesson on magnets. Child X was experimenting with two magnets. When she found out that they attract after being put together, she shared with her group members in a high-pitched voice by putting both magnets together: "Look, both of my magnets stick together! Look I have two magnets! Look! Look!" (ACT4B: 69-71). Teacher K echoed a similar observation where preschoolers explored with magnets: "I saw that they had this reaction: 'Oh! This is push and pull!'" (TK: 85). Child J was amazed when he observed how a magnetic item could be moved using a magnet without any direct contact with it. He expressed his excitement to child R sitting next to him, while saying: "It's moving! It's really following [the magnet] and moving when you put something below!" (ACT4B: 73).

Data also revealed that the creative play activities led preschoolers to increased engagement, persistence, and focus on the explorations. Preschoolers were observed to be absorbed in their tasks and persistent in solving problems. Interview data also reinforced the persistence and concentration preschoolers displayed during the activities. Teacher M cited the example of how the children tried their best to finish the car race using magnets by reaching to the flag,

despite some having difficulties moving the car (TM: 35). Teacher K agreed and noted that the preschoolers were “on track” (TK: 31) after the six activities. She pointed out that the preschoolers’ concentration seemed better in the creative play activities compared to their normal lessons.

Besides the positive aspects observed in the implementation of the creative play activities, data from observations indicated that several preschoolers required extra guidance from adults, without which they became disoriented. They waited and played around with their materials aimlessly, although instructions had been given to them to start exploring how to create art patterns using magnets. Child C was observed telling her group mates with a frown on her face, “No teacher is teaching us how to do! We can’t do it” (ACT5B: 25). Her friend Y replied in a bitter and disappointed tone, “They all (the rest of the groups) can do it so fast” (ACT5B: 26). Only after a teacher told them that the magnet should be at the bottom did they start to do the activity by themselves.

This resonated with teacher K’s statement, where she expressed that the children “sometimes want to play rather than focus [on their task]” (TK: 30). Despite positively acknowledging preschoolers’ focus on the activities, teacher M reasoned that their concentration was affected by several factors. She highlighted their dependence on “clear instructions about what they should do, and what they shouldn’t.” (TM: 36). She emphasised the importance to set a certain limit and relevant pointers for preschoolers’ exploration. She added that factors such as time allocation and peers around them could influence how much they focus on the activities.

Formulation of ideas

Data collected showed that the implementation of creative play activities also stimulated formulation and communication of ideas among preschoolers. The activities emphasised the important role of open-ended questions in stimulating preschoolers’ creativity. As teachers practised posing open-ended questions through the activities, the preschoolers responded with expressions of their ideas, which in itself, is a trait of creative expression.

The preschoolers were observed to produce improved quantity and quality of ideas. Not only did the preschoolers produce a variety of ideas, some of their ideas were also new, unique and unconventional. Other than using their ideas to invent and construct, data also

showed that preschoolers produced ideas to solve problems in the creative play activities.

On the other hand, it should also be acknowledged that not every preschooler had participated actively in the process of formulating ideas. Some preschoolers were less keen in expressing and sharing their ideas openly, they remained quiet and only responded when requested by the teacher. In the activities, teacher M attempted to involve all preschoolers in formulating ideas, predicting, and making inferences. She required them to respond to questions one by one such as why a certain object floats or sinks. While all of them could give a prediction as to whether an object floats or sinks, it was observed that only a few were able to further extend their ideas by explaining the reason behind their predictions.

When interviewed, teacher M noted of the possible language barrier among preschoolers that could have led to their difficulty in answering questions she posed. Nevertheless, she added that some preschoolers still attempted to answer through gestures (TM: 4). She supported her statement with an example of question she posed to the preschoolers: "What can we do with magnets?". While a number of preschoolers responded with answers such as using a magnet to pick up keys and magnets attracting one another, she found that some preschoolers were unprepared or unable to answer. A possible reason she suggested was that open-ended questions were considerably new to them: "Normally we don't ask all these [questions]" (TM: 82).

Furthermore, data indicated that some preschoolers lacked their own original ideas and were less capable to formulate ideas in order to solve problems. This was most evident when the preschoolers were exploring how to make clay float. After child R found that her clay floated when broken into tiny pieces, other preschoolers imitated in the same way and exclaimed that their clay had also floated (ACT2B: 59). In another instance, when the preschoolers were exploring with clay, child E was aimlessly looking around at her peers of the same group. She did not seem to have an idea of what kind of structure to make with her piece of clay. When she saw how her friend C constructed her structure, she imitated by making it into a similar design which was a long boat-like structure with the sides folded up (ACT2A: 40). Most ideas given by preschoolers were also similar as they tend to imitate one another. Likewise, teacher M reiterated that preschoolers who are "not ready will observe and follow others" (TM: 16).

Although data also showed that some preschoolers were less confident or capable to

produce ideas while exploring, teacher M stressed that preschoolers would be able to formulate ideas eventually with proper stimulation and encouragement. It is believed that with appropriate adult intervention and support, coupled with consistent provision of opportunities to formulate ideas through creative play; preschoolers would eventually improve in their ability of idea formulation and application.

Interactive partnership

As preschoolers worked together in their engagement to the activities implemented, data collected indicated that meaningful exchange of ideas took place and stimulated more idea formulation among the preschoolers, which constitutes a part of the creative development process. These discussions enabled preschoolers to learn from each other's ideas and stimulate deeper learning among them.

A teacher's role in initiating two-way, interactive discussions and conversations with preschoolers through questions or demonstrations is essential. When teacher K asked the class to think of objects that will sink, child X raised her hand and expressed her idea that a plastic water bottle would sink. Upon hearing child X's answer, child M quickly refuted that opinion; while child S interrupted: "It should float on water" as he gestured by holding his arm horizontally above the head. Child X then responded by an explanation on her earlier prediction: "With water it will sink" (ACPT1B: 69-71). Interactive and meaningful discussions as shown through the data collected provoked preschoolers to think and formulate valuable ideas within their social context, which stimulates creativity development.

Excerpts from data collected clearly indicated how creative play activities prompted preschoolers to discuss and communicate their ideas among themselves. During the boat construction activity, child L told his friend J:

L: The boat is leaking!

J: Look at mine!

L: Didn't water get into your boat?

J: Because...[inaudible due to background noise, as J shows his boat to L]

L: Mine is very heavy...

Another observation showed child-initiated conversations where child R shared her idea of structuring the clay into the shape of a snowman to make it float with her friends. One of her friends, child A responded in disagreement: "Snowman is heavy" (ACPT2B: 57). When child B suggested again that they should try to make a snowman with clay, child R disagreed: "Snowman will sink. It's heavy, it's fat" (ACPT2B: 58). This excerpt suggested how child R quickly modified her idea after communicating her idea with her peers.

On the other hand, however, data also indicated frustration of several preschoolers as they worked in a group. As six year-old preschoolers are still acquiring adequate competence to efficiently coordinate themselves in a group, it would be helpful for teachers to emphasise, and even set the sequence of turn-taking between the preschoolers. This strategy was suggested and applied by teacher M in the magnet maze activity (ACT5A: 30). As preschoolers in the research context may not be accustomed to cooperative play activities, the researcher contends that with proper management strategies, reinforcement, and sufficient support from teachers, preschoolers would develop increasing collaboration to work better in groups.

In a nutshell, the creative play activities enhanced preschoolers' abilities to cooperate and form mutual partnership with each other while working as a group. Data also affirmed the role of the creative play approach in providing opportunities for social and in-depth learning among preschoolers through interactive exchange of ideas. As preschoolers discuss their ideas with each other, they develop communication skills, which is one of the science process skills established in the Malaysian preschool curriculum.

Quantitative findings

In addition to qualitative findings, this section presents the quantitative data collected to measure the impact of the creative play approach on preschoolers' creativity. Findings of ANCOVA indicated that after controlling for the effect of pretest, a significant difference was found in preschoolers' post-test average creativity scores between the experimental and control groups, $F(1,53) = 5.23, p = 0.03, \eta^2 = 0.09$ (Table 4). The effect size was found to be moderate, Cohen's $d = 0.63$.

Table 4. *The Summary of ANCOVA for Overall Creativity Score by Program*

	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	η^2
Pretest	1	7443.49	34.66	.00*	.40
Program	1	1122.05	5.23	.03*	.09
Error	53	214.74			

* $p < .05$

Table 5 presents the overall creativity scores for both groups before and after controlling for pretest differences. Collectively, these findings established that preschoolers in the experimental group who had participated in the creative play-STEAM activities showed greater increment in their overall posttest score compared to the control group. This indicates that implementation of the creative play approach was effective in enhancing creativity among six-year-old preschoolers in the research context.

Table 5. *Overall Creativity Scores for Experimental and Control Groups*

	Experimental group (<i>n</i> = 29)			Control group (<i>n</i> = 27)		
	<i>M</i>	<i>SD</i>	<i>Adjusted M^a</i>	<i>M</i>	<i>SD</i>	<i>Adjusted M^b</i>
Average Pre	110.31	17.03		92.81	12.80	
Average Post	120.03	20.55	113.49	96.07	16.40	103.10

^{a,b} Mean scores after controlling for the effect of pretest.

Table 6 presents the ANCOVA posttest scores for the three specific TCAM subscales of creativity, which include fluency, originality, and imagination after controlling effects of pretest scores. Findings revealed no significant impact of program on the fluency score of preschoolers in their posttest after differences in pretest scores were controlled, $F(1,53) = 3.14$, $p = 0.08$, $\eta^2 = 0.06$. ANCOVA results indicated a significant difference in the impact of creative play on preschoolers' TCAM posttest originality scores, $F(1,53) = 7.73$, $p = 0.01$, $\eta^2 = 0.13$. Effect size was moderate, as reflected from the value of Cohen's $d = 0.77$. The experimental group performed significantly higher in their TCAM originality posttest score in comparison to the control group. Therefore, data indicates that creative play was effective in enhancing preschoolers' ability to formulate unique and original ideas.

Furthermore, findings from ANCOVA revealed a significant difference in the imagination scores between the two groups: $F(1, 53) = 6.70, p = 0.02, \eta^2 = 0.21$ (Table 6). The partial η^2 value implies a large effect, Cohen's $d = 1.03$. Despite the identified significant difference between groups, it is important to note that the assumption of homogeneity of regression slopes was violated for this subscale, as a significant interaction was found between the covariate and independent variable, $F(1,52) = 4.28, p = 0.04$. Since the p value is close to the threshold of $p = 0.05$, it was considered negligible but acknowledged as a limitation for this evaluation. Nevertheless, all other assumptions required to conduct an ANCOVA were met. Moreover, the overall creativity score would be the emphasis in evaluating the impact of the creative play approach on preschoolers' creativity. Hence, a significant impact could still be implied in the imagination score for the experimental group compared to its counterpart.

Table 6. ANCOVA for Fluency, Originality, and Imagination Scores by Program

TCAM Subscale	Source	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>	η^2
Fluency	Pretest	1	12071.69	27.99	<0.001*	.35
	Program	1	1352.17	3.14	.08	.06
	Error	53	431.23			
Originality	Pretest	1	12986.32	31.30	<0.001*	.37
	Program	1	3208.09	7.73	.01*	.13
	Error	53	414.89			
Imagination	Pretest	1	3420.09	47.09	<0.001*	.68
	Program	1	447.88	6.17	.02*	.21
	Error	52	72.63			

* $p < .05$

Table 7 outlines the fluency, originality, and imagination scores for both groups before and after controlling for pretest differences. Data indicated that the score difference in all three creativity subscales between pretest and posttest was higher in the experimental group in comparison with the control group.

Table 7. *Fluency, Originality, and Imagination Scores for Experimental and Control Groups*

TCAM Creativity Subscales		Experimental group (<i>n</i> = 29)			Control group (<i>n</i> = 27)		
		<i>M</i>	<i>SD</i>	<i>Adjusted M^a</i>	<i>M</i>	<i>SD</i>	<i>Adjusted M^b</i>
Fluency	Pre	122.62	22.23		99.70	16.53	
	Post	130.31	27.44	121.92	101.48	23.07	110.49
Originality	Pre	118.14	23.63		98.37	16.92	
	Post	129.86	28.35	122.71	98.19	21.91	105.87
Imagination	Pre	90.10	14.73		80.48	12.85	
	Post	100.14	10.68	97.57	88.37	12.50	91.13

^{a,b} Mean scores after controlling for the effect of pretest

Therefore, findings generally indicated that the creative play approach was effective in developing the overall creativity among preschoolers. Preschoolers in the experimental group scored significantly higher in their overall creativity as compared to their counterpart in the control group. In terms of creativity subscales, improvement in the scores of all three subscales in the experimental group was evident as compared to the control group; despite significant increase only being ascertained for two subscales, namely originality and imagination.

Conclusion and Discussion

Overall qualitative findings established that implementation of the creative play approach contributed to positive effects on preschoolers' creativity. Data collected indicated the effect of creative play in enhancing preschoolers' formulation of ideas, in terms of both quantity (fluency) and quality (originality). Upon data analysis, the researcher proposes that creative thinking also involves the confident expression of ideas and making relevant connection or linkages between ideas. Moreover, the creative play activities stimulated preschoolers to produce ideas, also to modify and refine them (flexibility), as well as elaborating and extending those ideas by making inferences and hypotheses (elaboration).

Preschoolers' formulation of unique ideas, invention of things from ordinary materials, motivation, and persistence in exploring, and their ability to cooperate in a group were clear indicators of creative behaviours (Torrance, 1977). As indicated through the findings, cooperation and confident communication of ideas among preschoolers as they engaged in the creative play-STEAM activities provided concrete evidence of science learning in accordance with Bustamante et al. (2017).

On the other hand, data implied that the abrupt change from the usual conventional way of learning to open-ended activities without standard ways of doing things may have caused a certain extent of frustration and uncertainty among some preschoolers. This was indicated through their difficulty working in groups, problems in formulating their own ideas, resorting to purposeless play with little cognitive awareness of what they were doing instead of self-directed experimentation during the process of creative play-STEAM activities. This could be justified by the learning environment that they were accustomed to, where instructions were given by teachers most of the time with minimal opportunities to think, explore in open-ended ways, or even to apply science process skills practically. As the activities are open-ended and involve independent critical and creative thinking, some young children may find it difficult to adapt to the child-centred activities without adequate guidance.

Nevertheless, given a longer period of time with appropriate support, guidance, and intervention, it is believed Malaysian preschoolers would be able to adapt more effectively to the creative play process and to explore in infinite and open-ended ways, hence developing their creativity as well as arousing their interest in exploring the world around them. Sharp (2004) posited the importance of adult guidance and stimulation in supporting preschoolers' creative development. She stressed that children's play could "become routine and repetitive" when they are "left entirely to their own device" (p. 10). In the process of developing preschoolers' creativity, while it is important to ensure that delivery of curriculum should be less teacher-centred, a good balance should be achieved at the same time to ensure that preschoolers acquire adequate stimulation and support from teachers.

Meanwhile for quantitative data, it is important to note initial difference between the experimental and control groups in terms of pretest and post-test mean scores. While both settings are privately owned and belong to non-governmental organisations, family socio-economic backgrounds, differences in environmental influences due to location,

developmental levels of children, teacher qualifications, and teaching approaches in both settings among others may vary to a certain extent, which could have possibly contributed to this initial difference. Considering the multifaceted aspects of early childhood education in Malaysia, it will only be fair to address this as a limitation of this quasi-experimental study.

Results from ANCOVA revealed statistically significant findings of the impact of creative play-STEAM activities on preschoolers' overall creativity. This reinforces and implies that creativity can be developed among preschoolers through creative play-STEAM activities. Several research studies revealed similar findings such as Garaigordobil and Berrueto (2011) who found significant effect of a play program on five to six year-old children's creative thinking. Likewise, Alfonso-Benlliure et al. (2013) highlighted positive impact in the overall creativity of preschoolers through a creativity intervention program. Findings also reaffirmed the potential of early science as an effective medium where creativity could be infused through interdisciplinary implementation as STEAM in the field of early childhood education (Cremin et al., 2015; Sari et al., 2021).

As a whole, data revealed that the creative play approach, integrated with STEAM elements contributed positively towards stimulating preschoolers' creativity, as well as promoting holistic learning and development. Although several challenges were present during the implementation, it is expected that with appropriate training and support, benefits towards young children's creativity would be more evident through prolonged implementation of creative play-STEAM activities.

This research study contributes to both practical and theoretical implications towards the field of early childhood education in the development of creativity as a crucial 21st century skill which should be nurtured from a young age. It has provided concrete empirical evidence that implementation of creative play-STEAM activities are effective in stimulating preschoolers' creativity. In contrast to conventional belief that arts are the only effective medium through which creativity is developed, this study has established that early science as a systematic domain, when delivered through hands-on creative play integrated with STEAM elements, could significantly contribute to the stimulation of creativity among preschoolers.

Findings of this present study also reiterated the urgent review in approaches used in preschools, specifically in Malaysia. To date, teacher-centred and academically inclined

approaches are still being implemented in preschools. Development of creativity among preschoolers is often neglected over emphasis on academic mastery, where little time is allocated for the development of creativity through play. In line with “play-work dichotomy” pointed out by several researchers (e.g., Anning, 2011; Bakar et al., 2015), teachers tend to view play only as an enjoyment or a “reward” for children during their free time after they complete the mandatory work required.

Since creativity could be developed and taught among young children, its importance to be integrated into the preschool curriculum in order to fulfil coming needs of a constantly evolving era should not be underestimated. As highlighted by Hunter-Doniger (2016), being deficient in creativity may impact children's learning at a young age; however, the impact would be greater when they grow up to be unequipped to meet the demands of an era that values creativity and innovation. More focus should be given to developing holistic 21st century skills including creativity among preschoolers. As long as preschools remain obliged to excessive pursuit of academic mastery, there will always be a shortage of time and space for creative play for preschoolers; which ultimately in the long-term could only bring disservice to the coming generations.

All preschoolers should be provided with equal opportunities to play creatively in order to develop their creativity. There should be no debate over the need to allocate sufficient time for preschoolers to play creatively and explore actively. Moreover, creative play should be used across the developmental areas, regardless of content areas in order to benefit preschoolers holistically. Theoretically, the three-step SEA model and core features of the creative play activities stipulated in this study could be a point of reference for early childhood stakeholders in effort to develop creativity among young children in their early childhood.

Moving forward, developing creativity purposefully through creative play should be vigorously advocated in practice as well as future research studies to further improve the quality of early childhood education in line with global needs in preparation for the coming Industrial Revolution 5.0. Considerations for future research directions may include longitudinal studies of young children's creativity and overall achievement in subsequent educational levels through practical implementation of creative play activities in their early childhood years.

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