Gamifications: Lexical and Trajectory Image (Image Representation) Methods as Cognitive Intervention in Teaching and Learning Numeracy

ABSTRACT

This paper describes a study with the goal of exposing children to gamification activities in teaching and learning numeracy based on the lexical method by implementing a Trajectory Image (Image Representator). Early childhood learning difficulties in understanding abstract and symbolic numerical concepts and procedures have been identified as an issue that needs to be addressed and acted as a starting point in the effort to shape the transformation of early childhood mathematics both in teaching and learning. Therefore, this study would like to inspect the role played by language as the medium used in translating the concept of numeracy whether it is applied contextually or in a variety of contexts. The respondents selected for this study were 10 teachers and 50 preschool children and a numeracy module instrument based on the Numeracy Comprehension Level Model Framework (MPKN) was chosen and applied to students by using lexical and image methods called Trajectory Image or Image Representator. Findings have shown that the understanding of preschool children related to previous aspects of numeracy is still at Level 1 and Level 2. It clearly stated that children are still unable to grasp the concept of numeracy in detail. This study has introduced the Numeracy Comprehension Level Model Framework and LessMath gamification products that have successfully provided a clear understanding to children regarding the depth understanding of numeracy aspects from Level 1 to Level 4. Furthermore, the outcomes of this study have shed some light on more effective teaching methods that can be employed in the aspect of numeracy teaching and learning which at the same time helps teachers in diversifying teaching methods in the field of numeracy.

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1. INTRODUCTION

Teaching and learning strategies in the 21st century is an approach that is deemed to be “flexible” as teachers are required to understand the knowledge or subject matter which needed to be adapted or altered at different contexts by formulating, constructing, organizing, modifying and understanding information that leads to a meaningful learning experience (Zichermann, 2010) [1]. As it is crucial to be ‘flexible’ in teaching as well as to fulfill the specific criteria’s, it is understood that the most suitable method of teaching and learning that can be emphasized is using the gamification approach. The gamification approach refers to game-design elements and game principles in non-game contexts. According to Zichermann [1], the gamification approach can be defined as a process of using games in solving problems. It is a relatively new term, but not a new concept. Historically, it is originated from the digital media industry and began with the term "fun ware" in 2008. Based on these aspects, it can be concluded that gamification is an experiment that utilizes 'power' in games. Dicheva et al. [2] stated that, besides fun and entertaining, games are also able to enhance knowledge.
and exposed students will crucial skills that were needed in real life such as problem-solving, creating collaboration as well as ability to embark in communication from education perspective.

Besides that, Geen et al. [3] also state that gamification can create autonomy and self-efficacy by providing students’ control as well as an effective tool that will encourage problem-solving depending on students’ input or knowledge (Langenfeldt et al., 2016) [4]. Game designers should have the ability to deliver these needs that are aligned with the gaming environment, which enable to satisfy players concurrently. In the context of education, teachers are required to have the competency as well as the ability in conducting meaningful learning and teaching despite the constraints caused by environmental changes such as obstacles in the COVID-19 pandemic that prevent teachers from administering face-to-face or traditional teaching methods due to the implementation of day-to-day Movement Control Orders (MCO) and Conditional Movement Control orders (CMCO) (Amshita et al., 2021) [5]. Therefore, this article attempts to examine the educational needs inclusively involving school children residing in hospitals. This programmed an alternative approach to give chance to school children residing or living in hospitals to learn effectively despite the constraints that they faced. The implementation of this type of educational needs is done to fulfill the government's intention in offering education to children which acted as a therapy as well as in realizing that their learning process has been delayed due to diseases that require long-term treatment in hospitals. Therefore, it is hoped that learning by gamification method can help children in the hospital schools to acquire knowledge similarly to their counterparts in a typical schools' environment.

2. GAMI FICATION ACTIVITIES AS AN APPROACH TO BE UTILIZED IN HOSPITAL SCHOOLS

In line with the aspirations of UNESCO, namely Education For All and continuous education, Malaysia has created another dimension in national education by creating Schools In Hospital (SDH). The main purpose is to ensure that educational services are accessible to all children and adolescents who are still within school age regardless of circumstances and conditions including pupils receiving treatment in the hospital. The establishment of SDH is a collaboration between the Ministry of Education Malaysia (MOE), Ministry of Health Malaysia (MOH), and Non-Governmental Organizations (NGOs) in order to provide education for students in hospitals with the willingness to learn (Nico Norjia, 2021) [6].

Based on the principle outlined by (UNESCO) which is "Education for All (EFA)" every child, adolescent, and adult should be given basic education. For example, Malaysia is one of the countries which provide support to every child in all ethnic minorities. It is evident that, the easy accessibility in education by Malaysian Government can lead to a better lives for these children despite the setback and circumstances that occur.

Learning in SDH is oriented towards an entertaining and flexible learner approach in a conducive environment. It is directly a therapy that can help the recovery process from health problems borne by the pupils. Therefore, in order to encourage SDH teachers to implement more creative and innovative teaching and facilitation in T&L, thinking strategy in basic operations that is more efficient should be emphasized so that the level of understanding among pupils can be clearly verified simultaneously. This thinking strategy accentuates that learning takes place in a combination of various levels (multi-grade) and is guided by the teacher as a facilitator. Learning attributes were conducted based on self-directed learning, self-accessed learning, and self-paced learning. This is parallel with the aspirations of Malaysia Education Plan 2013-2025 which is to provide an equal access to quality education.

Malaysia has taken various initiatives to expand access and equity in education as well as improving its quality in alignment with the Minister of Education recommendations in the conjunction with the UNESCO Malaysia 50-year celebration (Malaysia Education Blueprint 2013-2025) [7]. It is evident that, Malaysia has provided pupils with the essential intellectual, affective and psychomotor skills in a holistic and integrated manner to produce individuals who are intellectually, physically, emotionally and spiritually balanced and functionally literate. Therefore, a method of learning and assessment especially the element of improvement in thinking strategies is necessary for basic operations while focusing on 21st-century skills as well. Thus, a thinking strategy based on the Numeracy Comprehension Level Model (MPKN) has been developed by Ali (2014) with the intention that teachers should be able to determine the level of understanding of their students in basic operations and the learning process can be conducted in an entertaining manner. The findings of this study, are expected to introduce a module for the purpose of understanding the level of basic operational skills among SDH students in order to produce high-level thinking students (HLTS), attain soft skills, and foster self-learning for SDH students.

It is foreseeable that education is the most important asset in the development of individuals and countries. The National Education Philosophy (FKP) also clearly shows the role and importance of education as a continuous effort in producing Malaysians who are knowledgeable, responsible, and capable of
achieving personal well-being and contribute to the harmony and prosperity of society and country at large. High-quality education is one of the critical factors that needed to be emphasized as this can provide sense of security in life for most students (Lai, 2021). [9]. This is relevant in terms of improving life quality for all and in turn, stimulates the development of the country. In compliance with the recommendations of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), which contended “Education for All” where educational opportunities are provided from early childhood to lifelong education in adulthood, the Ministry of Education Malaysia (MOE) also took the initiative and undivided commitment in providing education to all regardless of race, religion, gender, level, and background. [See Blueprint Teacher Education Division (2014)] [10].

In the spirit to expand access and equity in education as well as to enhance its quality, various comprehensive strategies have been planned and implemented by MOE. In this regard, MOE also cooperates with other agencies and ministries in ensuring children and adolescents have the opportunity to experience normal education, especially special group students, namely students with specific needs and health problems. One of the initiatives implemented by MOE are the collaboration with the Ministry of Health Malaysia (MOH) and Yayasan Nurul Yaqeen (YNY) in which a specific educational system has been established in order to cater the needs of students with health problems who received long-term treatment in hospitals through Hospital In-School Program (SDH) in 2011. Based on the data derived from the Ministry of Health (MOH), the total admission of patients aged between 5 to 19 years is 239,075 people which is equivalent to nine percent from 2,159,919 patients in that particular year [11] Yayasan Nurul Yaqeen, (2014). These figures clearly show that the number of students who are unable to continue normal schooling due to hospitalization is quite enormous. Therefore, this program was created to provide assurance that these students will experience formal and structured education in a conducive environment as well as to avoid dropouts cases among them. Currently, there are 15 SDH Programs in Malaysia until April 2018 [12] (Special Education Division, 2018).

In order to ensure the learning process in SDH programs was done appropriately, teachers involved are selected based on certain criteria or characteristics and they have undergone several courses so as to make certain that they are qualified to serve in SDH. The specific training has to be done in order to make sure these teachers are capable to educate students with health problems in the hospital. The foremost challenge faced by SDH teachers is the adaptability to new environments and situations as it is different from the typical school environment. Thus, this study aims to assist teachers by developing a module for teaching and learning sessions in SDH. Due to the conditions of the students, an entertaining learner approach is used as it can help in dealing with these students who suffers health problems in a hospital environment. The effectiveness of this learning approach will depend on the commitment and dedication as well as teachers' attitudes towards their duties or responsibilities. In short, teachers who uphold these attributes will show better performance in this challenging environment.

The main objective of SDH program is to ensure that hospitalized students’ learning process is not affected or disrupted. This is equivalent with the goal of ‘education for all’ championed by the United Nations Educational, Scientific and Cultural Organizations (UNESCO) [13]. The curriculum is an important aspect to be considered in ensuring that an educational program can be implemented effectively. National curriculum is used in the implementation of SDH program, in executing the teaching and learning process (T&L) which includes five cycles, namely heart-to-heart sessions, T&L planning, T&L implementation, reflection and rehabilitation, strengthening, and styling [7]. The T&L process is usually carried out in groups in the classroom or individually in the ward. As SDH agents, teachers involved should be creative and wise in choosing appropriate approaches to cater to the needs of students with various levels of schooling and health conditions. In ensuring that the T&L process implemented in SDH takes place in a fun and meaningful setting, the entertainment-oriented learning approach has been outlined as the T&L method to be utilized in SDH [10].

T&L which uses a gamification approach has the characteristics of fun learning sessions because it contains elements of relaxation, entertainment, and is full of various interesting activities that are able to increase student’s involvement in the learning process. However, one of the obstacles that can be seen is teachers are unable to apply game-based T&L while implementing the T&L process simultaneously as it needs to be executed in a combination of multi-tasking, multi-lavelling, and multi-grading. Besides the setback, this type of T&L if it is successfully conducted, can enhance students learning process as it is more interactive and student-centered.

The gamification-based approach does not only sparks student’s interest in learning, but it can also be a form of therapy in relieving boredom as well as pain while training their psychomotor skills as well as developing creativity. Most children in SDH suffer from emotional problems and have low concentration [11]. This is the starting point of health problems experienced by children which in turn contributes to the discomfort in following the T&L process. One of the roles played by SDH teachers is to ensure that these emotional problems are reduced. In order to grasp this role, teachers need to have a clear understanding that
this problem is closely related to the aspects of child management which includes the implementation of heart-to-heart sessions and child welfare. However, a study has shown that teachers do not ponder on the aspects of psychomotor and cognitive readiness in providing T&L activities, especially in the ward which leads to a lesser impact while conducting SDH program [12].

In terms of teaching aspects, it is found that SDH teachers are prepared to teach, unfortunately, there is some teachers are unable to diversify the T&L method as it has to be aligned with the learning needs of children with various health problems and age levels. So as to ensure the effectiveness of SDH programs, teachers are encouraged or advised to employ entertaining learning methods during T&L process. SDH program caters to an approach that is educationally oriented and flexible in a conducive environment for the continuation of human capital development beyond conventional school practices [13]. In short, T&L which uses an entertaining learner approach has the characteristics of a fun learning session as it contains the elements of playing games.

In line with the objective of the SDH establishment in preparing formal and structured education in a conducive learning environment (fun learning) for hospitalized children, this type of education is provided to sick children through various approaches as a form of therapy to all ages of schooling regardless of place and limitations, as well as supporting and stimulating children to continue learning so as not to drop out of school.

Evidently, this article attempts to examine the implications of T&L towards children by focusing on the specific teaching context which is numeracy teaching. Numeracy can be defined ability to do basic calculations, comprehension in number systems, the ability to solve problems quantitatively, and the understanding of data collection along with the ability to interpret it into tables, graphs, and diagrams. Ministry of Education Malaysia (MOE) defines numeracy as the ability to read, write, count and arrange numbers up to a thousand, as well as efficient in basic mathematical operations such as adding, subtracting, multiplying, and dividing and can apply it in money, time and length measurement operations [14] (MOE 2011). With this regard, the MPKN module is essential to be utilized in order to determine the level of numeracy comprehension for each student [15]. Moreover, the approach or method used in this module is in the form of structured games whereby this can attract students to learn mathematics in a “fun Learning” setting.

Students’ cognitive ability can be enhanced by learning mathematics as this basic calculation knowledge will help them in their future learning outcomes. Hence, this type of knowledge needs to be sharpened from an early stage so as it can produce competent and skilled students in this particular subject. This is evident by [16], in which stated that, early mathematical skills are strong indicators or predictors of future mathematical abilities. This illustrates that early mathematics education is essential in order to provide optimal learning opportunities. As facilitators, teachers can include class discussions as a platform for children to explain, defend, draw conclusions, predict, and adapt the way they learn mathematical concepts. Besides that, encouragement from teachers is also important in order to verify the level of understanding among students by exposing them to different ways of presenting their views as well as enhancing students’ critical thinking skills at the same time.

Therefore, it is very important for teachers as facilitators to create positive relationships and conducive environment while conducting learning sessions by providing ample space and opportunities for children to express their personal views using mathematical concepts. The relationship between language and mathematics has been widely discussed in previous studies as literature findings showed that there is a positive relationship between mathematical mastery and language [17], [18], [19], [20], [21], [22], [23]. One of the issues that have been discussed is learning constraints among pre-schoolers. Pre-schoolers or preschool children have faced difficulty in understanding abstract and symbolic numerical concepts as well as procedures due to several causes. This constraint acted as a starting point in the effort to shape the transformation of mathematics teaching and learning of preschool children. This constraint is projected through the failure of teachers in delivering conceptual teaching according to mathematical terminology and procedures such as the concept of numeracy by using language efficiently that fades children's interest and mastery in this field. In short, this weakness stems from teachers' failure to understand mathematical goals, children's mathematical development, incompetent in handling mathematical activities, mathematical tests that do not help children's natural thinking development, and the form of concepts applied in teaching. Therefore, this study would like to examine the year extent language plays a role in translating numerical operations and terminology applied contextually or in a variety of contexts.

3. THE NUMERACY COMPREHENSION MODEL (MPKN)
The Numeracy Comprehension Model or MPKN module is designed with various levels or stages as the main objective is to verify students understanding in each level or stages. There are 4 levels or stages in this module, namely code interpretation (de-coding), knowledge acquisition (meaning-making), application (using), and analysis (analyzing) [24][25]. MPKN is adapted from a critical numeracy study model [26],[27] in which it can be employed in order to identify children’s numeracy comprehension levels.

There are four levels that were emphasized in the MPKN module in which contains certain characteristics that need to be achieved by each child. When all these levels of numeracy comprehension can be mastered by children, it can be concluded that they have fully reached the level of numeracy comprehension or understanding. This model has several important elements that can be used in developing numerical understanding among children. Firstly, provide children the opportunity to understand the concept of numeracy that will lead to complex thinking. Secondly, provide opportunities for exploration with others by working in pairs, in groups, or take part in whole-class discussions, whereby different views can be gathered. Finally, it also gives children the opportunity to produce an idea that uses their new knowledge, especially explaining the results to their peers, as well as preparation for answering exam questions [28].

Hence, by executing MPKN, children can unearth ideas and associate relationships between those ideas to solve a given problem [29]. It can also be used as a checklist for both teachers and children to verify their understanding of the topic or subject matter that has been implemented and also explore other types of thinking skills by analyzing the questions given. MPKN makes it easier for children to express their thoughts and apply them in daily life [30]. This checklist provides questions as follows:

1) What thoughts have been made?
2) Do other types of thinking need to be explored?
3) What happens when analyzing a question?

MPKN was created to ensure children are able to write and express their thought at various levels easily. In addition, each idea can be categorized according to its respective levels and the children will have the opportunity to contemplate various strategies used according to the set levels. At this stage, it is crucial for children to familiarize all the elements as it is quite difficult to adapt to the learning process at the beginning but it will eventually become easier at times. Besides numeracy, children can also use this module for other subjects.

It is difficult to identify what needs to be done and how the process takes place [31]. This is supported by [28] in which there is difficulty in identifying the next step to develop children’s sense of understanding on particular subject matter. Numeracy involves different ways of solving problems. So, there is not just one way to get the right answer and children find it useful to discuss the types of strategies that they use in real-life [28]. Therefore, MPKN also helps children to provide evidence and present arguments for each reason or answer given. The implementation of the module can assist children in building and boosting their self-confidence as well as acquire the ability to defend ideas so that they are able to recognize what they are expressing. So as this will produce children with a high confidence level as well as able to argue with the reasoning in decision-making. For each numeracy question, the solution step must follow the procedures and characteristics that have been set based on the levels in the MPKN. This simplifies the process of identifying each child’s level of numeracy comprehension based on the answers to each question posed. The framework of this model also gives children the opportunity to learn in a constructivist approach, which involves the application of new knowledge to the existing knowledge, building their own understanding, and creating new meaning.

Apparently, this model uses a lexical and image method called Trajectory Image or Image Representor. Lexical and Trajectory Image or Image Representor methods includes lexical representations and symbolism of objects in numeracy teaching. Based on the MPKN framework, children can nurture numerical understanding through the environment. This will help children develop intelligence which will lead to socially and economically balanced decisions and apply them in daily life. The model on its own can act as a transformation tool for teachers in changing the traditional ways of teaching. However, this model needs to be practiced in teaching and learning in order to gain compatibility with children. A child’s understanding of the aspects of numeracy will increase if he or she recognizes the features of numeracy in everyday situations more comprehensively [32].

Moreover, this model can assist children in building and understanding numeracy concepts more effectively as they can bring their existing knowledge as well as ideas that they have in their schemata. Besides that, it also has the ability to identify children’s schemata or existing knowledge by means of early exploration, brainstorming, challenging questions, and quizzes. The implementation of this model also can enhance student’s ability to think creatively and critically. So, the main role of a teacher is to investigate children’s early understanding by conducting some early activities that can help them stay focus on the task.
and to remind them of their existing knowledge. Other than that, teachers can utter some questions for them to think about, explore some different phenomena, and ask them to contribute ideas.

The MPKN framework can be used to generate numerical ideas based on the various topics in mathematics more extensively. For example, children were given some questions to familiarize themselves with assistance from these stages; De-coding, Meaning-making, Application, and finally Analysis [35]. It is evident that, MPKN is designed to overcome students' problems in understanding numeracy. This is due to frustration borne by teachers towards the teaching and learning process as children are facing difficulty in understanding the concept as well as unable to grasp information conveyed.

Therefore, in order to ensure the effectiveness of the module in the teaching and learning process, the right ideas need to be unearthed and the ability to draw solid conclusions based on mathematical reasoning should be implemented. It is called critical numeracy which has been defined by [33]. There is a clear analogy regarding critical numeracy, which involves the realization that all texts represent different views of the world [34].

4. THE NUMERACY COMPREHENSION MODEL (MPKN): AN APPLICATION

This article attempts to demonstrate a game-based educational project in numeracy operations for preschool children in a fun learning setting. A module called 'FUN LEARNING WITH NUMERACY' has been established as an approach to address the ambiguity of numeracy understanding. The Numeracy Comprehension Level Module (MPKN) is written to introduce a method of teaching and learning mathematics at the school level in hospitals by integrating the four levels of numeracy comprehension, namely code interpretation, knowledge acquisition, application, and analysis. Materials and activities provided can be utilized both by children as well as school mathematics teachers in hospitals in terms of constructing and understanding the numeracy concept whether specifically or generally. This module is also suitable for all mathematics educators for training purposes as it can produce more creative and innovative educators or teachers to come up with teaching and learning activities that prioritize high-level thinking.

In general, this module can trigger the idea of numeracy comprehensively by referring to the basic operating topics in the Primary School Standard Curriculum (KSSR) syllabus. Children were given some examples of non-routine questions related to real-life to help them become familiar with the four levels of numeracy comprehension. The activities planned in this module able to provide an opportunity for children to practice constructivist learning approach that involves relating new knowledge to their existing knowledge by building their own understanding with new meaning. In addition, this module also helps to build children's self-confidence as it will develop children's ability to argue and explain in detail the decision that they agreed on in a fun manner.

In the context of the KSSR curriculum, Mathematics has been deemed to be the best platform to develop the intellectual expertise of individuals in making logical reasoning, spatial visualization, analysis, and abstract thinking. Through learning and application of mathematics, children are also develop numeracy, reasoning, thinking, and problem-solving skills. Thus, this module is able to provide opportunities for children to perform creative tasks and gain fun experience as well as attained the feeling of excitement when performing activities that challenged their minds. Experiences like these can increase interest and motivate children to learn mathematics outside the classroom and at higher levels of difficulty.

Specifically, the module is written to:
(i) Identify the level of understanding on numeracy among children;
(ii) Assist children in understanding numeracy concept easily;
(iii) Entice children in learning mathematics;
(iv) Provide meaningful learning experiences to children;
(v) Build confidence among children in learning mathematics as well as making decisions;
(vi) Assist children in solving mathematical problems effectively;
(vii) Assist children in higher thinking order while learning mathematics;
(viii) Pose method used in understanding numeracy through the lexical method, i.e. children are able to translate the concept of numeracy using their own language
(ix) Ensure the significance in understanding symbolically of an object referred to as a Trajectory Image or Image Representator in terms of applications by providing evidence.

One of the example on the application of numeracy teaching based on the Teaching Model of Numeracy Comprehension (MPKN) is shown below, this article will demonstrate the implementation of this model in the basic operations chapter such as addition,

a. Addition

In 1323-1382, [35] Kilpatrick, J. S. (2001) used a diagram that looked like an additional symbol taken in the Proportioin Algorismus believed to have been written between 1356 and 1361 which is an
abbreviation for the word “et Latin” which means “and”. The plus symbol appears in the manuscript of a work believed to have been written in the 14th century. In the 1456 manuscript written in German, the word “et” is used for addition and is usually written closely to resemble the + symbol. The application of the MPKN Model will be shown in Figure 1 below.

Figure 1 explained the application of the Numeracy Comprehension Level Model Framework (MPKN) which features 4 levels of numeracy comprehension based on lexical methods represented by words and images called Trajectory Image or Image Representator. Level 1 is the Code Interpretation, i.e. children will read and trace words in a Mathematical sentence, stating the mathematical terminology used as the basis of calculation. At level 1 the Trajectory image or Image Representator method is applied through word detection and image representation through their ideas on mathematical problems found in mathematical sentences. Level 2 involves Acquiring Knowledge, which includes ways to get basic mathematical facts, explain the ideas and understanding of an object as well as define children's opinions on their ideas through their ways of thinking through lexical detection and terminology given to mathematical problems and translate mathematical problems through symbolism object, i.e. referred to as a Trajectory Image or Image Representator. Next, on Level 3, the child then applies mathematical problems in daily life by explaining the concepts and features of numeracy that are understood in his life and are able to explain in detail an object that has the same properties as the mathematical concept. In this case, in Level 3 as well, the lexical method and Trajectory Image or Image Representator are applied. Finally, at Level 4, namely, Analysis is that the child gives other evidence through words found in an environment that has the same concepts and characteristics as the numerical data are given. In this context, the numeracy method also uses the lexical method and the Trajectory Image or Image Representator.
This gamification-based learning is a form of learning that adheres to a student-centred constructivist teaching approach that empowers children in combining theory and practice as well as applying knowledge and skills to find solutions. Based on [36], usually, game-based learning sessions are implemented in three steps: i) the child is given a problem; ii) children enjoy learning while playing and iii) children can solve problems with critical ideas born orally and representation of objects applied from their living environment.

5. COGNITIVE INTERVENTION IN TEACHING AND LEARNING NUMERACY

Once the engagement with gamification activities has been completed, children will reflect on their ideas and skills. The exploratory activities are designed to provide a concrete experience for children to continue building knowledge and skills. This phase should be concrete and meaningful for children and ample time was given to explore their knowledge and skills. This phase may require children to identify new situations, learn new tasks, technologies, and procedures. As a result, children are mentally and physically involved in activities. The children are also able to build relationships, observe patterns, identify variables, and adapt to the teaching needs. The teacher acts as a facilitator or coach. The teacher begins the activity and gives students time and opportunity to investigate objects, materials, and situations based on each child's idea of a scenario or problem. If necessary, the teacher will guide the children as they begin to present explanations or solutions. The use of highlighted materials and concrete experience is required in the exploration phase. The exploration phase may be central to cooperative learning. Opportunities for children to interact, discuss, and even argue in the environment will support student-centred activities based on children's skills that directly exhibit different communication styles and personalities. In addition, children will present their ideas in order to build a shared understanding of a problem and suggested solutions.

[36] presents the phases of the constructivist instructional model from the aspect of 21st-century learning skills. Accordingly, the five phases presented by [37] consist of: i) Engagement phase (Engagement); ii) Exploration phase; iii) Explanation phase; iv) Elaboration phase and v) Evaluation phase. In the engagement phase, students are involved in learning tasks. Cognitively, students have to focus on an object, situation, or event. This activity introduces a new problem that students need to solve. The activities loaded in the exploration phase should have relevance to previous activities and future activities. This relationship is dependent on the learning task and maybe conceptual, procedural, or behavioural. The process of asking questions, defining problems, and drawing image representations from their ideas in understanding and solving problems in the field of numeracy is a way that can draw children's attention to instructional activities. The role of teachers is to introduce the situation and identify their assignments and learning outcomes. In addition, teachers also set the rules and procedures of activities that are consistent with the operation, procedures, and terminology of numeracy. The experience should be short and concise. The success of children's involvement can be seen in which they are stimulated by problems and actively motivated in learning activities.

Evidently, cognitive intervention is stimulated thru the following phases: i) Engagement phase; ii) Exploration phase; iii) Explanation phase; iv) Elaboration phase and v) Evaluation phase. Explanation (explanation) means an action or process, that is, a concept, process or skill that becomes clear and easy to understand. This exploratory process provides children and teachers with common terms related to the learning experience. In this phase, the teacher draws the child's attention to specific aspects that match the experience. Besides that, the explanation phases are also a way of organizing and giving common language to the exploration experience and for example, is the specific skill that this teacher emphasizes. Teachers need to ensure that children's explanations are clearly linked to experiences in the engagement and exploration phases. The key to this phase is to present concepts and skills in a concise, simple, clear, and accurate manner before moving on to the next phase.

The elaboration phase involves children's experiences in which they are encouraged to apply, develop, and detail relevant concepts or skills. An example of an appropriate detail phase for 21st-century skills is that children are involved in discussions and information-seeking activities. The goal of conducting group discussion is to identify and implement work-related approaches. During the group discussion, the children presented and defended their respective approaches related to the task. The outcome from this discussion is that the children able obtain a better definition of the task in terms of identifying and collecting information to complete the task successfully. Children acquire information from their peers, teachers, printed materials, experts, electronic databases, and experiments. As a result of engaging in group discussions, children are individually able to detail the concepts of assignments, the basics of information, and possible strategies for completing assignments. The interactions between children in groups are part of the detailing process. Group discussions and cooperative learning situations provide opportunities for
students to express their understanding of the subject as well as receive feedback from others who have almost the same level of understanding as them. The detailed phase also gives children the opportunity to engage in new situations and problems that require them to apply the same explanation. The transfer of learning and generalization of concepts and skills becomes the main goal in the detail phase.

Finally, in the evaluation phase, the feedback was given to children on the adequacy of the explanations given as well as their abilities. Informal assessments can occur from the beginning of the instructional arrangement. Teachers can complete formal assessments after the detail phase. During this phase, teachers conduct tests to determine the level of understanding of each child, which is related to their skills and abilities. In short, it is a good opportunity for children to use the acquired skills in their daily life as well as it can also able to access children’s understanding and present the solutions that they have generated.

6. CONCLUSION

Knowledge is deemed to be important as it needs to be imparted in an integrated manner into learning activities. In this regard, children with different learning needs should be given opportunities through a variety of learning techniques so that their potential can be optimized. Teachers play the main role in helping students to develop 21st-century skills through the use of methods that can enhance children’s abilities. The integration of technology in the classroom routine is a crucial component that need to be practiced in every learning session. The integration between information technology and media as well as making it coincide with pedagogy and learning techniques will facilitate and support children to achieve improvement in their learning. Technology integration offers children the opportunity to master important skills in this era such as collaboration skills, information skills as well as self-learning.

Besides that, several criteria have to be considered such as content and learning standards, children’s existing knowledge, resource preparation as well as the selection of appropriate combinations of strategies and skills in planning the lesson to use during teaching. Planning and implementing learning that meets the educational needs of the 21st century through interactive, interesting, and effective pedagogical practices should be a priority. In addition, learning process should be implemented meaningfully through learning by doing approach, i.e. children are stimulated to think as well as build their understanding of the subject matter. Pedagogy is used as a foundation in order to ensure teaching and learning carried out by teachers which include principles, techniques, and teaching processes are performed successfully. A systematic, interesting, and appropriate learning process can encourage children to be actively involved and maintain children’s motivation throughout learning activities.

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<td>10</td>
<td>&quot;Confidence and Success of Teachers Integrating ICT in TAF Enhancing Student Interests in Malay Literature&quot;, International Journal of Recent Technology and Engineering, 2019</td>
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Publication


Publication

Zamri Mahamod, Bhavani Somasundram. "Effectiveness of Cooperative Learning on the Achievement and Motivation of the Student in Learning Malay Language", Creative Education, 2017

Publication
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