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Conceptual Framework to Design and Develop "Grid and Game" Module for Remedial Pupils

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Abstract

The purpose of this study is to develop and evaluate the effectiveness of "Grid and Game" Module in improving Multiplication skills among Year Three remedial students. "Grid and Game" Module designed based on Constructivist Theory, Mastery Learning and Self-Determination Theory. This paper presented the literature review on remedial education, multiplication, Constructivist Theory, Self-Determination Theory and mastery learning. The aim of this paper is to design a conceptual framework for "Grid and Game" module for remedial pupils. This study employs ADDIE model as instructional design. Hence, five stages of process in this study are analysis, design, development, implementation, and evaluation. After the five stages of process in ADDIE model, the end product will be a "Grid and Game" module.

Keywords: Multiplication, Remedial Pupils, Module, ADDIE, Constructivist Theory.

Introduction

Remedial education is an essential program for pupils to grasp the fundamentals of reading, writing, and mathematics, which are closely tied to the caliber of education (Fong, 2018). As Malaysia's Ministry of Education (MOE) sets goals for students to master literacy and numeracy skills from level one in primary schools, the remedial program creates pathways for people to cultivate the traits in education to maintain alignment with global standards (Sector & Ministry of Education Malaysia, 2012). Beginning in 1970, the Ministry of Education established a remedial education program to help primary school pupils who were having difficulty learning the Malay language and mathematics overcome their learning difficulties (Ministry of Education Malaysia, 2013). As a result, remedial education became a crucial component of primary school and was further developed in the new KSSR curriculum.

Remedial pupils facing difficulties in learning the basic skill. Most of the remedial students left behind because of lack of interest in Mathematics. The way mathematical knowledge is taught, acquired, and assessed affects remedial students' interest in mathematics. The results of the study demonstrate that remedial students struggle with mathematics, although it is very important to them. The fundamental problem faced by remedial students are low memory power and lack of interest in doing repetitive mathematical questions (Polo-Blanco et al., 2022).

Literature Review

Remedial Education

The Malaysian Education Blueprint 2013–2025 (PPPM) is currently on its third wave. In an effort to improve the standard of national education, numerous changes have been implemented. Incorporating remedial education is one of the most successful ways to prevent school dropouts and guarantee that students have a solid grasp of the fundamentals of a great education, including reading, writing, and mathematics. The ability to read, write, and do mathematics at a basic level is crucial for knowledge exploration and it is the basis for academic achievement (Asnorhisham & Abdul Rahim, 2017).

In the year 2006, the Ministry of Education (MOE) urges teachers to reduce student illiteracy. This project is regarded as a KBSR advance program. For pupils who need remedial education, MOE launched KIA2M, an early reading and writing intervention program. (Kementerian Pendidikan Malaysia, 2013). Thus, to realize the program all schools urged to take serious actions in addressing students' problem who failed in reading and writing. In year 2010 MOE introduced program LINUS and developed to LINUS 2.0 in 2013. The implementation of LINUS and LINUS 2.0 are carried out via special screening two times per year and the results reported through the NKRA portal and guided by FasiLINUS (Kementerian Pendidikan Malaysia, 2013). Program PLaN introduced in year 2020 to guide remedial students in literacy and numeracy. In contrast from LINUS, program PLaN uses mastery level in classroom-based assessment (PBD) to identify the students with poor literacy and numeracy skill (Anniliza et al., 2021). Although the name and method of implementation are different, the overall objective is to improve remedial education and guarantee that all pupils can read, write, and count after three years of primary school to remains the same.

Only 1% of the population has been identified as having special needs and is enrolled in appropriate special education program, according to the Malaysia Education Blueprint (PPPM) 2013–2025's preliminary report. Due to the fact that people with disabilities hardly ever self-register, it is likely that this number significantly underestimates the number of children in the nation who require special care. In the Preliminary Report of the PPPM 2013–2025, Tan Sri Dato' Haji Muhyiddin (2012) suggests that providing more opportunities and resources for gifted people, people with special needs, people from indigenous and other minority groups, and people from other groups with needs will further increase the system's inclusiveness.

In conclusion, remedial education is crucial for every stage of learning, from kindergarten through university (Yoong & Ahmad, 2018). Remedial education may help students with lower academic achievement to study more effectively and catch up to the other students' level. Remedial education is not categorized as Special Education in Malaysia. However, students receiving remedial instruction are regarded as having special needs. As a result, the study's emphasis will be on remedial instruction for pupils who need it in order to develop their multiplication skills.

Multiplication Skill

Children are frequently given the impression that multiplication is more difficult than addition. For instance, throughout the course of early schooling, addition concepts are presented for some time before multiplication concepts, and multiplication facts are more likely to be taught in a memorized, rote style than addition facts (Shin & Bryant, 2015). The direction of effect for multiplication and division changes depending on the size of the

operands. Numbers higher than one are always produced when multiplied, however numbers between zero and one are never multiplied in this manner (Park et al., 2021).

The first education of our child must include learning how to multiply. The word problem provides a setting where the size of the group (multiplicand) and the number of groups (multiplier) are made explicit inside the word problem because early multiplication issues employ discrete amounts rather than exposing students to multiplication like 4 x 5 (Polo-Blanco et al., 2022). Repetitive additions could be used to solve multiplication, but these techniques place heavy demands on verbal working memory and raise the likelihood of errors (García-Orza et al., 2021).

Math data, especially multiplication tables, are arranged in an interconnected network in long-term memory, enabling people to easily recall the solutions to simplest math problems like 3 x 4 (Karnes et al., 2012). As children learn to memorize the multiplication tables in the majority of countries, mental calculations for single-digit multiplication are seen as crucial (Lambert et al., 2021). Multiplication facts are stored verbally, and verbal modality is more commonly used to retrieve multiplication data. Therefore, a child's verbal working memory capacity determines how quickly they can solve mental multiplication problems (Lee et al., 2021). In relation to this, the research also demonstrates that remedial students must rely on other procedures until they have reached full automaticity in solving multiplication problems.

As a result, memorizing the multiplication facts is one of the quickest ways to solve multiplication problems, especially for remedial pupils. Multiplication is a crucial skill. Effective solutions appropriate to the level of the remedial pupils should be designed in order to help them memorize the multiplication facts. Thus, memorizing multiplication facts is the final phase of the “Grid and Game” Module.

Constructivist Theory

Constructivist theory is known as “mental construction” method in teaching and learning based on cognition learning (Jin et al., 2020). Cognitive and constructivist theories were influenced by writers like Piaget, Vygotsky, Bruner, and Glaser, who are also regarded as the theory's creators (Tomljenović & Vorkapić, 2020). Among all, Bruner is considered as one of the founding fathers of Constructivism and his theory lay in constructivist framework.

According to Bruner (1960); Weibell (2011), an effective curriculum should start with: (1) a simple and basic idea that underlies a more complex idea, (2) a focus on the intuitive idea and its use in the early stages of teaching and learning, (3) repeated recall and reflection of the basic idea, and (4) the facilitation of the use of the basic idea in a more complex form to help students gain a deeper understanding. Constructivist theory helps pupils to learn by fusing new information with previous opinions (Pande & Bharathi, 2020). As it enables students to gain new knowledge based on experiences, ideas, and attitudes, it has an impact on teaching and learning.

Constructivism is a learning philosophy based on the idea that reflecting on experiences and creating our own understanding of the world, learners can develop a more concrete comprehension of the material they are studying (Al-Qaysi et al., 2021). Numerous disciplines can benefit from constructivism. However, constructivism is a theory of education that focuses on how people learn, what influences learning, and how curriculum and instruction should be structured to best serve educational goals in context with what is known about learning (Pande & Bharathi, 2020).

In conclusion, constructivism is a theory that encourages students to learn via doing. As it supports activities that are focused on the students, it is appropriate for use in the remedial

classroom of today. According to this hypothesis, as they engage in practical tasks, students learn by creating their own knowledge. Every student may attain a different level of learning depending on their involvement and the way knowledge is constructed in their mindset. Teachers assume the role of facilitator and provide instructional activities that allow students to learn new things. The pupils in this study apply the "Grid and Game" Module by resolving the multiplication problems in the student Gridline. In the meanwhile, the interactive "Grid and Game" Module game could engage students in mathematics and keep them interested and motivated.

Self-Determination Theory

The goal of self-determination theory (SDT), which Deci and Ryan first suggested in 1985, is to explain human need and wellbeing in society. The fundamental tenet of this theory contends that people are motivated to act or refrain from acting in response to three physiological requirements, namely autonomy, competence, and relatedness (Mills & Allen, 2020). A person's motivation is influenced by their sense of autonomy (the sense of being self-governed and self-endorsed), competence (the sense of being efficient and competent), and relatedness (the sense of being connected, in love with, and interacting with others). By meeting the three psychological criteria outlined above, SDT enables people to feel positive motivation. The impacts of needs-based support on students' engagement, motivation, and learning were thereby strengthened by the SDT hypothesis.

The self-determination hypothesis makes a distinction between an individual's external motivation, which is doing something to receive it in return or to avoid getting something in return, and internal motivation, which is doing something because it's essential, interesting, fun, or valuable to them (Chiu, 2021). Compared to external incentive, internal motivation produces superior results. Engagement in learning and teaching is related to the behavior's displayed by people, such as affection, warmth, and delight, which are encouraging signs of a close and caring teacher-student connection (Teixeira et al., 2020). Therefore, self-determination theory contributes engagement and optimal learning to increase and achieve academic achievement of remedial students.

Mastery Learning

Mastery learning is a type of instruction that gives students the freedom to take their time in completing the learning objectives. In mastery learning, the learning material is divided into several small learning units, and only students who have mastered the necessary knowledge or skills are permitted to move on to the subsequent learning unit (Chang & Chen, 2020). In other words, preparation for the subsequent instructional phase is a sign of mastery learning (Barsuk et al., 2018). Following a series of stages through academic units that conclude with the demonstration of skills and knowledge of a subject before moving on to the next unit is known as mastery learning (Adeniji et al., 2018).

Mastery learning, which is based on Benjamin Bloom's interpretations and adaptations of John Carroll's model of classroom learning, involves delivering initial training to the entire class through a number of approaches, with individualized instruction being delivered as necessary after a mastery the examination (Betts, 2019). Reading and mathematics are the two subject areas that use the mastery learning technique the most, because reading and arithmetic skills build on one another and are sequential (Yemi, 2018).

Mastery learning is an innovative approach that gives all students who are taking mathematics the chance to understand any specific topic in a particular mathematics course

based on their aptitude and ability to learn mathematics at a pace that feels comfortable to them (Vermylen et al., 2019). An excellent teaching strategy that outperforms the traditional classroom is mastery learning because it can control each student's specific learning pace and offer quick feedback, a digital game is the perfect medium for executing the mastery learning principle (Lengetti et al., 2020). Additionally, it benefits weaker students more by implementing mastery learning (McGaghie & Harris, 2018).

Mastery learning, in essence, is a system that divides the learning into smaller chunks so that students can advance at their own pace. It is a strategy appropriate for pupils requiring remedial instruction in mathematics. As a result, the researcher used mastery learning in the "Grid and Game" Module by segmenting the material into small sections, and the students were required to master a multiplication fact before moving on to the next unit. As each student learns at their own pace, mastery learning is a good option for remedial pupils.

Conceptual Framework

Figure 1 shows the conceptual framework of "Grid and Game" module. The researcher presents the complete diagram of the independent and dependent variables involved in and connected to the research undertaken in this conceptual framework.

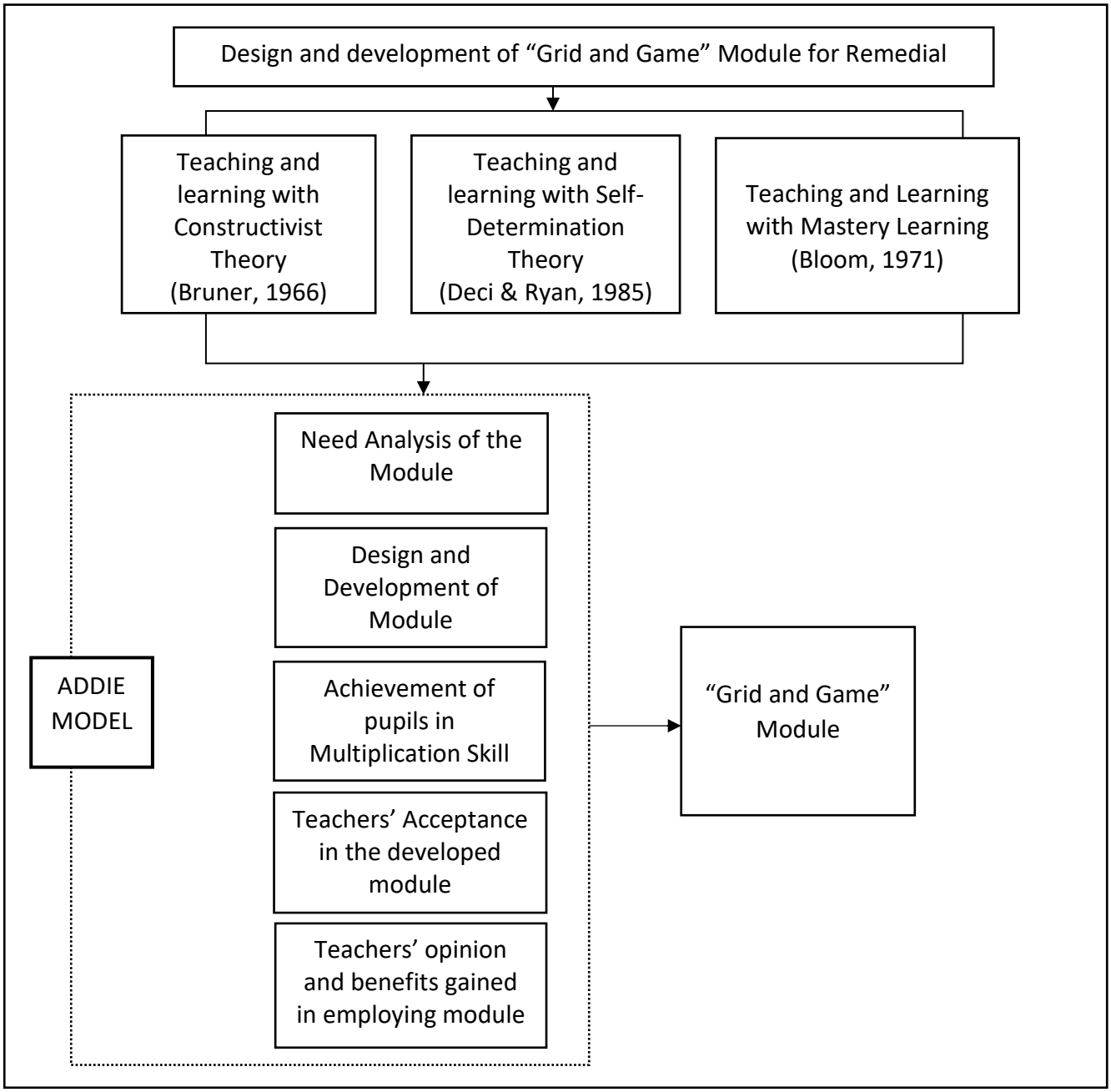

Figure 1. Conceptual Framework

The goal of the research is to create a module that will help remedial pupils to master multiplication skill more effectively, as well as to assess the effectiveness of the created module. It is envisaged that the development of "Grid and Game" module will help teachers to improve remedial pupils' multiplication skill. This in specific manners improves students' interest and specifically enhances their skills in multiplication. This study examines the connection between mastering multiplication skill, need analysis of the module, design and development of the module, teachers' acceptance, and opinions and benefits of using the module within the context of this conceptual framework. The researcher created a conceptual framework as a guide for implementing this research based on the aforesaid descriptions.

Discussion and Conclusion

In this study, the literature review had been made on remedial education, multiplication, Constructivist Theory, Self Determination Theory, and mastery learning. To design and develop "Grid and Game" module, the researcher had designed a conceptual framework. This study will employ ADDIE model as an instructional design. The study is divided into five stages of process, which are needs analysis, design, development, implementation, and evaluation. During stage one, the data of interview from the needs analysis will be analyzed using Nvivo. During stage two and three, the "Grid and Game" will be designed and developed. In stage four, the module will be implemented for remedial pupils and the data analyzed will be analyzed according to pre and post-test. During stage five, evaluation of "Grid and Game" will be carried out using questionnaire with remedial teachers. Hence, the result of this study is a product entitled "Grid and Game" module to improve multiplication skill for remedial pupils in primary schools.

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