

## Mathematical Learning Approach for Special Education Pupils: The Effectiveness of Mauselis Board in Improving Adding Skills

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**Abstract.** Mathematic learning difficulties are common, significant, and worthy of serious attention. Many issues that have had an impact on bilingual education have also had an impact on Special Education. One of the issues is, adding skill. Adding skill is one of the most crucial skills that every pupil needs to acquire with learning disabilities. The use of ‘MauSeLis Board’ (Maujud-Sebut-Tulis) which means ‘Concrete-Pronounce-Write’ in the classroom has been an effective tool for helping Special Education pupils in building up their skills in adding and reading the numbers aloud. This study investigates the improvement of the pupils with learning disabilities’ adding skill in Mathematic subject at school. The study’s sole objective was (i) to identify the Mauselis board’s effectiveness in Mathematical subjects among Special Education pupils. The MauSeLis board was invented for teaching and learning purposes based on the Bruner Theory and CRA Model (Concrete-Pictorial-Abstract). The data collection was conducted through pre-test and post-test conducted on 20 pupils with learning disabilities as respondents in Negeri Sembilan, Malaysia. The study found significant differences in terms of their adding-questions scores before and after using MauSelis Board in teaching and learning sessions. Quantitative data were analyzed using descriptive statistics such as frequency and percentage to describe the Pre and Post Test results. The research study’s finding showed a positive result as the Special Education pupils who involved in the study showed consistent improvement throughout the sessions. This study also found that MauSeLis Board in teaching and learning sessions is a highly effective approach that develops a deep and better understanding of mathematic skill among the Special Education pupils as well as contributing to active, fun, and meaningful learning session. In conclusion, this study summarises that the teaching and learning approach among special needs pupils should emphasize effective hands-on activities rather than rote learning.

**Keywords:** MauSeLis Board, teaching aid, mathematics, special education student

### INTRODUCTION

In the 21st century learning, each educational institution greatly emphasises on the effective teaching and learning process. Countless of approaches, techniques, materials and tools have been tried and used during teaching and learning sessions mainly to ensure a more creative, active and high quality educational process. Dedication to improve the quality of teaching and learning process among the young learners especially is mainly aim to contribute to the development of excellent society as a whole.

According to (Ibrahim, 2013) teaching and learning strategy is the systematic and effective trick, or contrivance used to accomplish the learning objectives that would also affect the learners’ encoding process, i.e., how they learn, acquire and utilise the desired ideas, concept, generalisation, skills, etc in a more creative, critical and innovative way.

Every learner is unique and owns individual learning style that is affected by his personality factors. Teacher’s task is to provide a variety of carefully structured classroom activities catering the different preferences. There are different learning preferences in children such as visual learners, auditory

learners, kinaesthetic learners, interpersonal learners, intrapersonal learners and also special needs learners.

Zalizan (2009) defined Special Education Needs (SEN) learners as children who have variety of learning difficulties especially in terms of reading, writing and counting. Special education needs learners with any of the mentioned learning problems are among the learners who require an attractive teaching and learning process. Hence, appropriate attention/focus skill during the period of lessons is very crucial for this group of learners. Attention/Focus skill will not only engage the special education learners throughout the whole learning process but also it will help them acquire the basic learning skills like reading, writing and counting. Appropriate and creative approaches or reinforcement and methods during the T&L sessions have the power to create lasting engagement among the learners and set them up for successful development in the particular subject.

Every teacher should be able to apply strategies that will help meet the needs of learners with SEN and reduce learning difficulties as well as behaviour, social or emotional problems. Haraway (2012) believes that low understanding of academic concepts will allow

interferences to happen. This is because demotivated pupils lead to behavioural problems which then can be the biggest challenge in the classroom. These consequences are preventable if teachers are able to adopt and provide necessary strategies and methods during the teaching and learning process prior to keeping them focused and attracted to the lesson, especially Mathematic subject; which subject requires high concentration and understanding among the SEN learners.

All students, including special needs children have the right to learn math and feel confident in their ability to do math (Furner, Yahya and Duffy, 2005). Individuals with special needs require support in acquiring various academic and social skills in order to maintain their lives. Mathematic has a facilitative role in both individuals with special needs and individuals with typical development. Everyone uses mathematics in our day to day lives; without math, the world would be missing a key component in its makeup. According to Ridener (2004), math is so important because it is such a huge part of our daily lives; counting, creating spending budgets, paying for groceries, buying things on sale, count money, reading the time, measure things, call anybody and much more. This is supported by Rays (2001) who stated that mathematic is a tool used by every human being on a daily basis, not only by the mathematicians or teachers or business persons. Thus, it shows that mathematic is one of the skills that equip human's daily life and the lack of capability in the mastery of mathematical skills is one of the issues to be overcome by teachers, parents and the community.

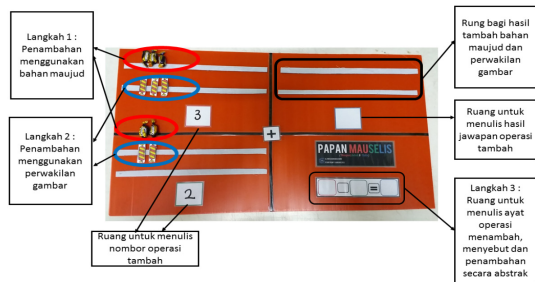
For many individuals, mathematic arises as a difficult field. Therefore, it is considered that individuals with special needs experience more difficulties in learning mathematics. This paper emphasised on the mastery of basic operations which is Addition among the special needs learners. According to Schwartz (2008), the definition of addition is a process to merge two or more a bunch of number sets and adding it is the simplest operation to do. However, in the context of special education, Hegarty & Ves (2002) claimed that each special needs learners had a different level of capabilities and abilities especially on their cognitive skills. The incorporation of various effective approaches in teaching mathematics especially the addition-operation to these special needs learners will promote better understanding of the concept. This is because Carpernter, Franke, Jacobs, Fennema & Empson (1998) believed that if children with special needs are given opportunities to learn mathematics the meaningful way, their conceptual understanding and ability to transfer the knowledge will be increased.

*Bruner theory and cra model*, When teaching mathematics, the used of concrete objects, (Concrete),

pictorial representations (Representational), followed by abstract symbols (Abstract) is called the Concrete to Representational to Abstract (CRA) instructional strategy might be crucial. This strategy is mostly used with learners especially the special education needs learners (Witzel, 2005). This approach has found to increase the understanding of abstract mathematical concepts and ideas (Witzel, Mercer & Miller, 2003).

The CRA instructional approach is a three-stage process. The first stage allows learners to manipulate concrete objects to solve problems. During the concrete phase learners see, hear and move objects to demonstrate what is happening with the numbers as well as the procedures to solve the problems. When implementing instructions in the C-stage, the teacher must demonstrate solving the mathematic problems through modelling. When modelling, the teacher shows learners what is happening with the numbers as well as the procedures. It is then, followed by a pictorial Representation-stage of the concept that was physically manipulated in the C-stage. The R-stage acts as a bridge, building necessary connections between solving problems using objects in the C-stage to solving problems using numbers in the Abstract-stage. Learners will then use pictures or drawings to represent a solution to the same concept that was manipulated with objects when in the C-stage (Flores, 2009)

Every level of CRA is strategically designed to prepare the learners for the next level of learning. There are several studies conducted by researchers in the country regarding the use of Concrete–Representation – Abstract strategy and its importance in the learning process. According to Poon, Yeon & Noor Azlan (2012) The CRA strategy is a good way to teach students who have learning difficulties especially those who have problems understanding mathematical concepts, operations and applications. This is because the CRA framework utilises the three stages as tools to aid in accurate computation and provides the learners with a concrete, visual tool to develop the necessary procedural skills for solving abstract equations (Maccini, Mulcahy, & Wilson, 2007); Miller & Hudson, 2007). This strategy helps learners to learn and easily acquire the concepts through the “hands-on” activity which includes concrete physical objects and also to understand the concept through the integration of graphs, photos and many more realias. For instance, the addition problem of  $1 + 4$  could first be represented by physical objects such as cats or cubes, next by a visual diagram of the cubes representing the cats, and finally by a number sentences. The goal of concreteness fading is to start with a manipulative to help learners make the necessary connections and then gradually move away from the physical objects to the most efficient and abstract representations.



**Figure 1. Mauselis Board**

The teaching and learning process of mathematic subject among the special needs learners is basically depending on the cognitive development of the learners. Therefore, it is highly recommended for all teachers to follow the CRA strategy in the teaching and learning process, sequencing from concrete material (enactive) to the use of photo or visual diagram (iconic) before the learners are introduced to the representation of symbols (symbolic) (Mohamad et.al, 2009). Therefore, observation approach was used as main instrument for this research to investigate how the MAUSELIS BOARD which highlights on the CRA strategy would help the special needs learners in acquiring the addition-operation in mathematic subject.

*Teaching aids*, Teaching aids are tool and equipment used in teaching as supplement in classroom instruction to enhance the interest of learners. Teaching materials are important catalysts of effective instructions as well as help learners to improve their basic learning skills.

In line with the aspiration of the Ministry of Education to implement and apply the 21st century learning, the field of education requires a systematic, orderly and more progressive changes in teaching style. Teaching and learning session becomes interesting when a teacher uses different materials because it directly involves learners in the teaching-learning process. It makes lessons extra enjoyable and memorable. This shows that attractive materials are key factor in creating and providing effective teaching and learning environments.

In conjunction with the effort to improve SEN learners' achievement academically, it urges teachers to work extraordinarily in line with the globalisation of education, (Yusof et.al, 2002). Teachers are mostly required to be extra creative and innovative, be more proactive as well as up-to-date in designing relevant and suitable innovations or teaching materials to be used in teaching and learning sessions. This is supported by Jasmi et.al., (2011), as they believed that it is very important for the teachers to consider the quality of the teaching materials for the learning sessions and in catering every single needs of learners with disabilities.

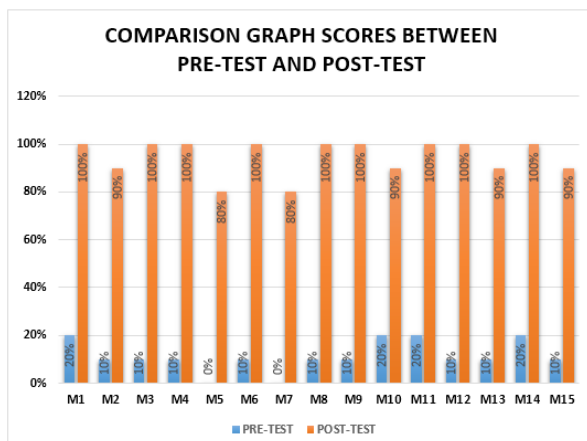
One other crucial factor about teaching aids is that the materials should meet the main objectives of the lessons apart from catering the learners' needs as every person has different level of understanding. As Cunningsworth says, "Learners need to feel that the materials from which they are learning have to be connected with the real world and at the same time they must be related positively to the aspects of their inner make up such as age, level of education, social attitudes, intellectual ability and level of emotional maturity.

In traditional teaching and learning method, teachers often focus on transferring knowledge, skills and values to learners via chalk and talk approach or the standard questions-and-answers segments and learners are often expected to listen and answer when required and read textbooks and texts. While teachers are seen to be passionate about the subject that they are teaching, the learners on the hand has become passive. Therefore, the traditional method of teaching is often characterised as poor teaching technique. According to Zanzali & Daud (2010), the rote traditional learning is no longer effective in the current century; the chalk and talk, the use of textbook and teacher as the person in charge of every role throughout the lesson are no longer suitable and will not be enough for the current education. Instead, teachers should be able to apply different teaching styles, incorporating teamwork and cooperative learning, adopting and promoting lifelong learning skills, empowering the learners to play an active role in their education as well as integrate the use of technology in the learning process. Many previous researchers have proven that with these new teaching and learning styles and approaches, it was reported that most learners improved positively and their interest in a particular subject showed increasing improvement.

It is therefore, very crucial to implement interesting and effective teaching techniques and methods with the aid of attractive teaching materials to enhance better development of the learners be it young learners, adult learners or even special needs learners. This study tries to understand the effectiveness of teaching aids in the teaching of mathematic towards special needs learners compared to the boring chalk-and-talk lecture method (Hassan, 2004)

## METHOD

In order to accomplish the objectives of this study, quantitative research approach was used to determine the effectiveness of MAUSELIS board in teaching addition-operation in mathematic classroom among the special needs learners.



**Figure 2. Comparison Graph Scores Between Pre Test and Post Test**

This research design of this study collected data and information based on the tests administered to 15 special education learners comprising of different categories of learning problem such as slow learner, late development, autistics and hyperactive from a school with Special Education Integration Programme in Negeri Sembilan, Malaysia. The respondents selected for the research mostly have problems in addition-operation but are teachable.

Data collection involved three different tests which are pre-test, while-test and post-test. The different tests were administered in order to ensure the result of learners' performance in learning addition-operation with the use of MAUSELIS board are fair and reliable at the end of the study.

Pre-test : to examine the SEN learners' ability to solve the addition questions. While-test : to examine the SEN learners' ability to solve the addition question with the use of MAUSELIS BOARD. Post-test : to examine the SEN learners' ability and understanding of the concept taught using MAUSELIS board and how they solve the questions.

The results from all three tests were analysed to see the graph of the result; before, while and after the intervention. There was also checklist used to record the scores earned by every sample involved on each session. Each score earned in each intervention session will be compared in the form of a line chart.

The graph showed positive improvement of the SEN learners involved in the study.

## FINDING AND DISCUSSION

### Finding

Based on the graph drawn from the data collected figure 2, almost all respondents successfully showed a positive improvement with an increase score of more than 70% increment. Consequently, the highest

percentage score was achieved by the respondent of the M3 & M4 successfully registered an increase of 90% from the data recorded in pre-test score. Meanwhile, for the respondent of M1, M2, M5, M6, M7 M11 M13 M14 & M15 managed to obtain up to 80% score as compared to the marks recorded previously during the pre-test score.

This has shown that there was an increase in the percentage scores that were so high and significantly between the score score of pre-test before the Mauselis board was carried out with a score score of post-operative tests after interventions performed by Researchers. Therefore, to re-order the study questions can be proved based on the values and data obtained. Whether through the data obtained during the intervention session, the data for the achievement of the student sheet score is made from session 1 to session 8 and reinforced and strengthened with the percentage comparison data Between a pre-Test score score with post-study test score. Thus, the use of Mauselis boards used in the intervention session was successful in assisting the special education students to enhance skills in mathematics.

### Discussion

The data collected from this study has shown that MAUSELIS board is just another, albeit very effective learning resource which all special education teachers who are teaching mathematic need to consider when planning the lesson for the learners. The implementation of the MAUSELIS board in mathematic lesson not only allows high participation and involvement of the learners but also reflects on the application of the theory of Multiple Intelligence by Howard Gardner. This is because this board also affects their different aspects of intelligence such as kinaesthetic, visual-spatial and auditory intelligence. This, gives the learners with difficulties, the space to explore the learning process which may improve their cognitive development and skills that serve to elevate learners' confidence level and hence allows them to excel in the area, especially mathematic. The result proved that MAUSELIS board has helped to increase the cognitive skills of the learners with difficulties in this research.

Furthermore, the findings also showed that the usage of the teaching aid is able to attract the interest of learners to participate in the activities conducted. The lesson conducted that was based on real experience or the usage of concrete materials brought a bigger impact and influence to learners compared to visuals or audio, language, symbols, static or moving pictures. It is believed that if a learner studies by using his or her own experience, it can help him or her to remember

and understand the activities participated in. According to Othman et al. (2008), real-time experience learning can be divided into two types, a learning scenario that involves learners applying the knowledge, skills and emotions in a real situation appropriately and learning through direct participation of the personal experience possessed by the learners. MAUSELIS board had positive impact on grabbing learners' attention throughout the mathematic lesson.

This finding is in agreement with Salleh, Ong & Taib (2015) who states that a teaching and learning environment that supports and encourages critical thinking through teacher practices and aids enables learners to be exposed to an appropriate level of subject matter and content, thus enabling learners to engage in questions and answers sessions held for the lesson. This is because, when learners are actively involved in the Q&A lesson, that means, the method has successfully helped the learners to understand the concept taught during the lesson. This research has proved that the CRA strategy applied in the MAUSELIS board allowed learners to have better understanding of the mathematical concept especially the addition-operation. This is supported by Drahman & Saleh (2004) who claimed that Concrete-Representation-Abstract strategy is always a big help for young learners to understand any mathematical knowledge because of the use of concrete objects to experience the lesson apart from encourages critical thinking skills to solve the problems. Fun and meaningful learning experience effect in increasing the cognitive level, motivation level as well as attention level of the learners especially those with special needs.

It can be concluded that the usage of MAUSELIS board as teaching aid is able to help the special needs learners to expand and increase their understanding levels and mathematical skills. This has brought positive effect to their learning process and also to teachers' teaching style.

Based on the findings as well as limitations of the study, the researcher has concluded that there are a few recommendations that could be made for future research. The recommendations are offered in the following:

(i) The materials should be alluring in terms of appearance. The future researchers might as well use bigger, brighter and catchy colour and elements for the picture so the learners can experience amazing fun and meaningful learning environment during the process of learning mathematic using the board.

(ii) This MAUSELIS board can be beneficial for other subjects too. This is because the Bruner Theory which highlights on the CRA strategy is a great strategy to help young learners or special needs learners to learn reading, writing, speaking or even listening skills. This strategy I believed to be able to enhance learners to improve their thinking and cognitive skills. For

special education learners, their imagination hardly goes beyond and over because of the interference in their brain so this CRA strategy through the use of MAUSELIS board will give them the opportunity to explore further, regardless of the subjects and difficulties.

(iii) Itigson & Zewe (2003) cited that technology is essential in teaching and learning mathematic. It helps to improve the way mathematics should be taught and enhances better understanding for the concepts. Many researchers have carried out studies to evaluate the benefits of using ICT in mathematics. However, there is still no research has been done for the use of ICT to teach mathematics among SEN learners. Hence, maybe the future researchers can consider teaching addition-operation using MAUSELIS Board but in the concept of ICT. That will be a great eye-opener for all special education teachers in the country.

(iv) In order to make better generalisation for the result, it should be conducted using respondent from all 14 states in Malaysia; teaching mathematic to special education learners using the board.

(v) All of the shortcomings faced in the study can be used as guidelines to improve the methodology in the future research. This research also can be considered as a stepping stone to a more detailed, in depth research which can contribute to a new knowledge in this field.

## CONCLUSION

There are a lot of other contributing factors towards the learning of mathematics and numbers in the classroom. MAUSELIS board is one of the thousand ways to learn the subject in the 21<sup>st</sup> century era. This study suggests that special education teachers should be made aware of every individual learner's needs and thus need to start helping them improve their mathematical skills. It is crucial to equip our young generations with better skills of mathematic as math is so important because it is such a huge part of our daily lives.

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