

## The Effectiveness of Chip Mental Arithmetic Kit in Teaching and Learning in 21<sup>st</sup> Centuries for Topic Addition and Subtraction

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<https://doi.org/10.26782/jmcms.2019.02.00027>

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### Abstract

*This article presents the effectiveness of Chip Mental Arithmetic Kit in teaching and learning of topic addition and subtraction. The methods used in the research were descriptive analysis. The sample consist of two hundred and forty-six (246) standard one students of 3 primary school in total in the state of Selangor and Perak. Samples were divided into groups and the Chip Mental Arithmetic Kit was distributed to each group. The researcher applied the Chip Mental Arithmetic Kit in the classroom during their teaching and learning process of topic addition and subtraction in primary education. The instrument used by researcher is questionnaire. The questionnaire contained 21 questions which include the figure, the reliability, the endurance of Chip Mental Arithmetic Kit. The student's answers were analyzed. The result showed that Chip Mental Arithmetic Kit had a significant positive impact among the students, and the latter preferred Chip Mental Arithmetic Kit rather than using the traditional method of teaching addition and subtraction in standard one. The findings of the current study encouraged teachers and students to use Chip Mental Arithmetic Kit in their teaching and learning process.*

**Keywords :** addition and subtraction, Chip Mental Arithmetic Kit, teaching manipulative

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### I. Introduction

Mathematics hold a very important role in Malaysia Education system to ensure that our country able to compete with others develop countries and be able to face the

challenge of teaching and learning 21<sup>st</sup> century. In the age of science and technology, the teaching and learning in classrooms are affected by it. Studies in the fields of education find that the learning process will be more effective if students' mathematical knowledge is built by teaching and learning process that involves the use of teaching aids[II].

Manipulatives help students develop conceptual understanding of mathematical ideas by representing the ideas in multiple ways. Using mathematics manipulatives and models offers many benefits. Just as a picture can be worth a thousand words, manipulatives can provide visual representations of ideas, helping students to know and to understand mathematics better. Manipulatives enhance the abilities of students at all levels to reason and communicate [VI].

There are various manipulative kit have been used for teaching and learning topic addition and subtraction. The approaches depend on the size, kit speciality, kit capabilities and etc. Every approach has their own purpose to find better performance in term of time, cost, distance and complexity. There were a lot of researches about investigating the effects of teaching manipulative in mathematics. According to the findings of those studies, they found that manipulative increased the mathematics achievement[V],[III],[VIII]. Furthermore, some of the researches also suggested that, students become more active, their motivation towards learning was increased and they adopt a positive attitude towards mathematics lesson when teaching manipulative are employed in mathematics classes. Learning through activities by using teaching manipulative gave students pleasure and increased their motivation and allowed them to learn while having fun[VII],[XI],[III].

The objective of this paper is to investigate the effects of using the Chip Mental Arithmetic Kit on standard one student in teaching and learning addition and subtraction. According to Aida Suraya et al. (2008), students should be able to master the basic operations for base numbers, decimals and fractions as basics of teaching and learning of mathematics. This mean, when a student is asked by a teacher to find a combination of two numbers that generates an answer, they cannot determine the two numbers. In mathematics, there is a time when students make mistakes, they may be considered a simple and basic mathematical mistake. Misleading learning or a delicate understanding in mathematics becomes the cause of this topic is not understand by student and higher tendency of making mistakes when dealing with this question, this attracts us to further the research regarding this matter [XII].

## **II. Chip Mental Arithmetic Kit**

Chip Mental Arithmetic Kit isa teaching kit that is built to further enhance the interest of standard one student in learning addition and subtraction in topic Whole Number up till 100. This Chip Mental Arithmetic Kit consists of 32 Chip Mental Arithmetic which is coin-like shape and a number platform. These chips come out with variety of colors (red, blue, yellow, green, orange, purple) with numbers from 0 to 20. A number platformconsists of Number Platform 10 (front) and Operation Number Platform

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(back).A very interesting and easy-to-manage design makes this Chip Arithmetic Mental Kit easy to use by teachers and students both inside and outside of the classroom.

The Number Platform 10 1(a) and Operation Number Platform 1 (b) is shown in Fig. 1.



1 (a)



1 (b)

**Fig. 1** Number Platform 10 and Operation Number Platform

This Number Platform was made by using 3D Printer with Magma Filament 1.75mm. Number Platform was designed small in size which is size of palm where it is very light to hold and easy to flip. More interesting about this Number Platform, it is so convenient and easy to carry which make learning of addition and subtraction can occur anywhere at any time. While Number Platform was built from combination of three circle that connected to one another and have triangle in middle that differentiate this two Number Platform. This unique Number Platform consists of two platforms which is Number Platform 10 (in front) and Operation Number Platform (back) as shown in Fig.1. Number Platform 10 only suitable for operation addition of three numbers that produce digit 10 in total. The combination of chip mental arithmetic kit of three numbers is restricted from 0 to 9 only. While Operation Number Platform is used for operation addition and subtraction. To identify Operation Number Platform, there are three symbols that located in the triangle at the middle of the number platform which is plus (+), minus (-) and equal (=). All numbers from 0 to 20 of Chip Mental Arithmetic Kit can be used for this Operation Number Platform.

The Chip Mental Arithmetic is shown in Fig. 2.

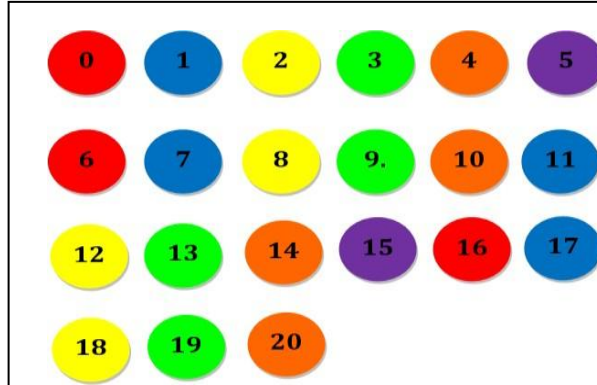


Fig. 2 Chip Mental Arithmetic

3D-Printer was used to make a set of 32 colourful pieces of Chip Mental Arithmetic which contain two sets of number from 0 to 20. This Chip Mental Arithmetic was built from geometrical same size circle and it looks like a coin. This chip is very light and the colour selected for chip is a mixture of prime, secondary and tertiary colour. This chip consists of 21 numbers with different colour which is as follows 0=red, 1=blue, 2=yellow, 3=green, 4=orange, 5=purple, 6=red, 7=blue, 8=yellow, 9=green, 10=orange, 11=blue, 12=yellow, 13=green, 14=orange, 15=purple, 16=red, 17=blue, 18=yellow, 19=green, 20=orange. Chip Mental Arithmetic can be used by both Number Platform.

### Method of using Chip Mental Arithmetic Kit

#### Method of using Number Platform 10

First, students need to identify the question. Then, start from choosing the number platform either operation number platform or number platform 10. Identify number platform 10 which have triangle shape and printed number 10 in the middle of the platform as shown in Fig. 3.



Fig. 3 Number Platform 10

Next, choose three chip mental arithmetic that make the addition of the number stated in the chip is 10. For examples the addition of number 3, 7 and 0 result in 10 in total ( $3 + 7 + 0 = 10$ ) as shown in Fig. 4.



Fig. 4 Chip Mental Arithmetic with number 3, 7 and 0

Then, place the chip mental arithmetic at the number platform chosen as shown in Fig. 5.



Fig. 5 Chip Mental Arithmetic place at Number Platform 10

Students will discuss with teachers regarding the answer and this process is repeated until a lot of combinations of three numbers form.

### Method of using Operation Number Platform

Identify Operation Number Platform which have triangle shape and printed  $+$ ,  $-$ ,  $=$  in the middle of the platform as shown in Fig. 6.



Fig. 6 Operation Number Platform

Next, choose operation either addition or subtraction and select one chip mental arithmetic to be place at the equal (=) parts. For example, operation addition was selected and number 5 was place in the Operation Number Platforms shown in Fig. 7.



Fig. 7 Chip Mental Arithmetic with number 5

Then, place two chip mental arithmetic that make the addition of the number stated in the chip is 5. For examples the addition of number 2 and 3 which result in 5 in total ( $2 + 3 = 5$ ) as shown in Fig. 8.



Fig. 8 Addition of Chip Mental Arithmetic with number 2 and 3

Students will discuss with teachers regarding the answer and this process is repeat until a lot of combination of two numbers form. Teaching manual was built according to the specifications of the mathematics curriculum for standard 1, which comprises one main subtopic which is to identify the combination of two or more numbers.

### III. Methodology

This research attempts to gain an insight on how to make easy and effective for the students in standard one to understanding topic addition and subtraction. The study group of this research consists of two hundred and forty-six standard one students in the school area of Batang Padang, Perak. Since the study group was selected from among groups that had already been formed, random

sampling was used. A pilot study was conducted on thirty-seven standard one students to ensure the students can understand each item well. Research fixed the items which was not clear after the pilot test conducted. A short program of using Chip Mental Arithmetic Kit in addition and subtraction was given to the selected standard one student. After the program, a questionnaire was given to each student. Students were led by the researcher to read all the questions. All the students that involved in the program were asked to answer all the questions personally.

The data were collected and analyzed by using the software of SPSS Version 23.0. The instruments consisted of questionnaire of 21 items. All items were related to teaching and learning of the topic addition and subtraction by using Chip Mental Arithmetic Kit. The instruments were checked by two experienced mathematics teachers that have been teaching standard one student more than 10 years, for purpose to get the reliability and validity of the questionnaire as an instrument in the study.

#### IV. Results and Discussion

In order to analyze the effectiveness of Chip Mental Arithmetic Kit, normality test was conducted. Table 1 shows the Normality test that was conducted by analyzing the value of skewness and kurtosis. According to George and Mallery (2005), skewness and kurtosis values between -2 and +2 is acceptable. It can be noted from the Table 1 that values of skewness and kurtosis fall within the acceptable range of -2, to +2, indicating that the data is fairly normal and the basic assumption of parametric is fulfilled.

Table 1

Normality Test

	No of respondents	Skewness		Kurtosis	
		Statistics	Std. Error	Statistics	Std. Error
Effectiveness of using kit	246	-.823	.155	-.389	.309

The reliability test is a method for checking a scale's internal consistency. Researcher used Cronbach's alpha coefficient as the indicator to check the degree of consistency. The value of Cronbach's alpha for all constructs/variables must be above 0.6. Ideally the Cronbach's alpha should be above 0.7, according to Nunnally (1967), the Cronbach's alpha coefficient of a scale can be accepted if above 0.6. Overall, all the variables have a

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 Cronbach's alpha coefficient of 0.870. To conclude, all the items in this study are consistent and reliable. Table 2 shows the reliability test.

Table 2

Reliability Test

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.870	.870	21

The result of the output was obtained from the percentage. Table 3 shows descriptive analysis.



No.	Item	N	Scale			mean	t	Sig.
			DA	A	SA			
1.	I like to learn using Chip Mental Arithmetic Kit	246	4.5%	8.5%	87.0%	2.83	91.480	.000*
2.	Chip Mental Arithmetic Kit is an interesting manipulative kit	246	1.2%	29.3%	69.5%	2.68	85.556	.000*
3.	Chip Mental Arithmetic Kit can help me in learning addition and subtraction better	246	6.1%	14.2%	79.7%	2.74	76.133	.000*
4.	I manage to learn addition and subtraction faster than before	246	10.2%	19.9%	69.9%	2.60	61.036	.000*
5.	I am more interested to learn this topic	246	6.9%	17.9%	75.2%	2.68	70.507	.000*
6.	I am so satisfied with Chip Mental Arithmetic Kit learning outcomes	246	6.9%	13.4%	79.7%	2.73	73.612	.000*
7.	I feel so happy to learn this game-based activity	246	1.6%	16.3%	82.1%	2.80	100.835	.000*
8.	Chip Mental Arithmetic Kit is suitable for learning topic addition and subtraction	246	5.3%	17.5%	77.2%	2.72	76.762	.000*
9.	I have to use Chip Mental Arithmetic Kit to learn addition and subtraction	246	8.5%	19.9%	71.5%	2.63	64.783	.000*
10.	I suggest the use of Chip Mental Arithmetic Kit among students in primary school	246	3.7%	17.9%	78.5%	2.75	84.083	.000*
11.	The appealing figure of Chip Mental Arithmetic Kit make me want to use it frequently	246	6.5%	15.9%	77.6%	2.71	73.281	.000*
12.	I like all the colour of Chip Mental Arithmetic Kit	246	3.7%	11.8%	84.6%	2.81	92.134	.000*
13.	I like all the shape (coin-like shape and mickey mouse shape) being implemented to Chip Mental Arithmetic Kit	246	4.9%	10.6%	84.6%	2.80	85.934	.000*
14.	Chip Mental Arithmetic Kit is very light and easy to carry	246	1.6%	17.5%	80.9%	2.79	98.521	.000*
15.	Chip Mental Arithmetic Kit help me in applying manipulative kit in learning topic addition and subtraction	246	6.9%	13.8%	79.3%	2.72	73.303	.000*
16.	Manual guide to use Chip Mental Arithmetic Kit is understandable	246	2.0%	13.0%	85.0%	2.83	103.739	.000*
17.	I have no problem while using Chip Mental Arithmetic Kit in learning	246	3.3%	20.3%	76.4%	2.73	83.638	.000*
18.	Generally, I have no problem of using Chip Mental Arithmetic Kit	246	4.9%	16.3%	78.9%	2.74	79.631	.000*
19.	I will fully utilize Chip Mental Arithmetic Kit frequently once I manage to use the kit successfully	246	3.7%	10.2%	86.2%	2.83	94.840	.000*
20.	I do not need a longer time to understand how to use Chip Mental Arithmetic Kit	246	8.9%	16.7%	74.4%	2.65	65.288	.000*
21.	Mistake that I have made in addition and subtraction is easy to be corrected when I am using Chip Mental Arithmetic Kit	246	6.5%	16.7%	76.8%	2.70	72.697	.000*
<b>Total</b>		<b>246</b>	<b>5.0%</b>	<b>18.2%</b>	<b>76.8%</b>	<b>2.74</b>	<b>150.326</b>	<b>.000*</b>

Table 3

## Descriptive Analysis

**DA** = Disagree, **A** = Agree, **SA**= Strongly Agree / Note: \* = significant, (p>0.05) = not significant

From Table 3, 21 item of the questionnaire shows significant  $p < 0.05$  with the  $t$  value of 150.326. From 21 items, “I like to learn using Chip Mental Arithmetic Kit” is the highest percentage of strongly agree (87.0%). While the item that have the least percentage of strongly agree (69.5%) is “Chip Mental Arithmetic Kit is an interesting manipulative kit”. Can be concluded that student like to learn using Chip Mental Arithmetic Kit but they did not think that this manipulative is interesting enough. But still, the number of students who agree and strongly agree in both questions defeat the disagree. Meanwhile, the highest percentage of disagree (10.2%) is on item “I manage to learn addition and subtraction faster than before”. While the least percentage of disagree (1.2%) on item “Chip Mental Arithmetic Kit is an interesting manipulative kit”. From this percentage result, shows that students slowly make a step to learning addition and subtraction using Chip Mental Arithmetic Kit since they find the manipulative kit is interesting.

Table 4

## Overall Summary

Scale	Frequency	Percentage (%)
Disagree	265	4.998
Agree	966	18.220
Strongly Agree	4071	76.782
Total	5302	100

From table 4 above, the mode and median that show the highest frequency is Strongly Agree scale which is 4071 in average percentage of 76.782. Therefore, can be conclude that Chip Mental Arithmetic Kit is an effective manipulative kit in teaching and learning topic addition and subtraction.

## V. Findings

The respondents discovered that Chip Mental Arithmetic Kit is useful, easy to apply, and provides a best learning outcome. The students are confident in using the Chip Mental Arithmetic Kit in their class and ready to learn with other student how to use Chip Mental Arithmetic Kit in learning topic addition and subtraction. Most of students shows their interest in using Chip Mental Arithmetic Kit rather than “chalk and talk” methods in learning addition and subtraction. Chip Mental Arithmetic Kit is also compatible with Malaysian Mathematics Curriculum which is used by every school in Malaysia. The students also can use Chip Mental Arithmetic Kit at their home

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and play by their self without teacher guidance. The easy to carry size of Chip Mental Arithmetic Kit make it possible to be used anywhere and anytime.

## **VI. Conclusion**

The study shows that using Chip Mental Arithmetic Kit as an educational tool or teaching aid has a significant positive effect on students of standard one in learning the topic addition and subtraction. To engage the modern era, teachers should exert effort to include Chip Mental Arithmetic Kit in their classroom during the teaching and learning process. The students also like to play with Chip Mental Arithmetic Kit than be in normal teaching and learning process.

## **VII. Acknowledgement**

The authors would like to thank the Sultan Idris Education University under the university research grant (2017-0234-107-01) for financial support.

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