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Trainee Teacher's Perception of TamTol Kit Construction on Integer Topics for Form One Students

Muhammad Izzuddin Hazan
Department of Mathematics, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, Tanjong Malim, Perak, Malaysia

Shazlyn Milleana Shaharudin*
Department of Mathematics, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, Tanjong Malim, Perak, Malaysia

Nor'ain Mohd Tajudin
Department of Mathematics, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, Tanjong Malim, Perak, Malaysia

Abstract **- This study was conducted to identify the trainee teachers' perceptions on the construction of TamTol Kit related to integer topics for form one students. It focuses on two main aspects: (i) building a TamTol Kit for a satisfactory validity on form 1 integer topics and (ii) satisfactory trainee teachers' perceptions of the TamTol Kit's usability on form one integer topics. The TamTol Kit validation was performed by three experts. A total of 10 items were selected and had received the high-level experts' approval. The respondents of this study consist of 92 trainee teachers from Sultan Idris Education University, Perak. This study used survey methods that involved quantitative survey work. The research instrument used was a structured questionnaire, which contained 20 items, that used 4-point Likert scale feedback. A set of questionnaires was distributed to the respondents via google form to obtain the necessary information and data. The data obtained were analyzed by using the Statistical Package for Social Science (SPSS) computer software to obtain the value of reliability, frequency, percentage and mean. The findings showed that the level of construction of the TamTol Kit for the trainee mathematics teachers was positive. Essentially, the design of this kit aims to help educators to utilize it as a teaching aid tool in order to solve students' problems regarding the integer topics involving addition and subtraction operations. To conclude, the research findings indicate that the use of teaching aids is important for the teachers as self-assist tools during the teaching and learning process. This study implies that using the teaching aids does not only bring many benefits to the teachers but also gives a positive impact on the students.**

INTRODUCTION

In the teaching of mathematics, teachers have been exposed to various teaching and learning (TL) resources as well as the effective use of teaching aids. A mathematics teacher should be skilled in identifying and making decisions in selecting the most effective teaching aids [15]. Other required skills include optimizing the resources to achieve the planned learning outcomes as well as helping to stimulate students' minds in mastering the subject of mathematics [15]. Various methods have been used by teachers in attracting students to this subject. 21st-century skills such as collaboration skills, critical thinking skills, creativity and effective communication skills can be nurtured through activities such as problem-solving and design innovation projects [3].

According to [14], students typically have problems in conceptualizing integers and arithmetic operations. [4] had stated that the understanding of negative numbers requires the students to acknowledge values that are less than 0 (which is difficult to see physically), making this an abstract mathematical concept. In addition, [13] study on the introduction of negative integers among the students had found that they need to assimilate and adapt the negative numbers in their thinking schemes about numbers as this concept could be confusing.

The use of teaching aids in delivering the teaching in the classroom is an important element that needs to be applied by every teacher with regards to the country's mission to become a developed country by 2020. With the use of teaching aids, teachers can explain things and lesson concepts more accurately than oral explanations [10].

To solve the problem, this study uses teaching aids to overcome the students' issues and specially to attract the students in mastering the basic concepts of integers. The TL process becomes more effective if the student education curriculum utilizes the teaching aids or game activities. Through this approach, students can learn and understand the issues occurring around them in a state that is pleasing and meaningful to them [9]. The objective of this study is to identify the perceptions and opinions of prospective trainee teachers on the use of teaching aids in the TL of mathematics subject. Based on this problem statement, this study aims to build a TamTol Kit for a satisfactory validity in integer topics for form 1 students and satisfactory prospective trainee teachers' perceptions on the usability of TamTol Kit on form 1 integer topics.

This kit is capable of meeting the main needs of TL in achieving effective learning outcomes as well as serving as an effort to increase the use of teaching aids and diversify educators' teaching resources in schools and institutions of higher learning. The study results of [15] may be able to encourage trainee teachers to stay positive in diversifying the use of teaching aids to increase students' interest in learning. This kit educates and facilitates the students to achieve the set goals and they will be taught to be more active in achieving those goals. Next, the acquired skills will directly and indirectly help the students to master integer topics. This is in line with a study by [1] entitled 'Level of Understanding of Form Two Students for Negative Number Topics' on 150 students where their overall achievement on the integer topics was moderate. Among the skills that will be accomplished are counting, communication and problem-solving skills. Teachers are the facilitators, mentors and driving force who are responsible for the selection of various TL methods that have a significant impact on the students. Additionally, teachers need to prioritize the comprehension of concepts among the students in understanding the step that needs to be emphasized in solving mathematical problems. Teachers' mastery of topics, selecting and using of teaching methods as well as the setting of appropriate learning activities greatly influence the effectiveness and outcomes of the learning. Through the approach of this method, teachers will be more creative in teaching as well as using various techniques in attracting students.

DESIGN METHODOLOGY

This study is a type of quantitative study. It involves the development method of Design and Development Research (DDR). According to [2], the design and development studies are divided into two categories, namely specific product or program development studies and model studies. The second form of DDR was used that is a model study, specifically known as the ADDIE Model. The ADDIE model is one of the earliest models that produces instructional design. It is the source of the emergence of other models such as the Ross and Kemp models, the Seels model, and the Dick and Carey model.

This study is descriptive and it aims to obtain the validity and analyze the usability of the TamTol Kit from the perception of trainee mathematics teachers at the Sultan Idris Education University. To conduct this study, the data were collected using questionnaires distributed to them through online platforms. This questionnaire was adapted from previous work [11][16]. The validity of this questionnaire instrument was evaluated by 3 experts consisting of two lecturers from the Faculty of Science and Mathematics, UPSI and a mathematics teacher of Sekolah Menengah Kebangsaan Tanah Merah (1), Tanah Merah, Kelantan. The population of this study is focused on UPSI trainee mathematics teacher groups, A171 and A172, with a total of 121 people who had taken the subjects KPD3016 and KPD3026. Of that number, 92 people were selected according to the Kriejci and Morgan's schedule.

The data for this study was collected through an online platform by using a set of questionnaires as the main instrument of the study. The set of questionnaires for the experts in evaluating the TamTol Kit used in this study is divided into three parts, namely Part A, Part B and Part C. Part A contains items related to the experts' background such as position, highest academic qualifications, field of expertise and number of years of work experience. Part B is about the TamTol Kit evaluation that contains 10 items and part C is the confirmation of the TamTol Kit evaluation. Content Validity Index (CVI) was used to indicate the content validity. Expert review is necessary to ensure the accuracy of the construct as well as the clarity of the content [7]. Thus, the constructed evaluation instruments were given to the experts with skills in related fields to review and to ensure that the content is appropriate while meeting the goals of the study. Researchers have been referring to the percentage of experts' acknowledgement on the item acceptance used by [5] from the "You and Consumerism" instrument construction handbook. Figure 1 below is the formula used to determine the validity of the content while Table 1 shows the number of items for the evaluation of the TamTol Kit.

$$\text{Content Validity Item, } (I-CVI) = \frac{\text{Number of Experts Agreed}}{\text{Number of Experts}}$$

$$\text{Content Validity Index For All Items, } (S-CVI) = \frac{\text{Total } I-CVI}{\text{Total of Items}}$$

FIGURE 1
FORMULA TO DETERMINE THE VALIDITY OF THE CONTENT

In the survey conducted, the set of questionnaires to test the kit usability in this study is divided into two parts, namely Part A and Part B. Part A contains demographic information and part B contains 20 items on the usability of the TamTol Kit construction for form one integer topics.

There are three parts to Part B, namely the usability, user convenience and satisfaction. Table 2 shows the number of items for the usability questionnaire.

TABLE I
NUMBER OF ITEMS FOR EACH TAMTOL KIT EVALUATION CATEGORY

Section	Topic	Total Questions
A	Experts Information	5
B	TamTol Kit Rating	10
C	Space Confirmation	-

TABLE II
NUMBER OF ITEMS FOR USABILITY QUESTIONNAIRE CATEGORY

Section	Topic	Total Questions
A	Demographic Information	7
B (I)	Usability	6
B (II)	User Convenience	6
B (III)	Satisfaction	8

In this study, a four-point scale questionnaire was selected and the study respondents had to choose answers that best suited their own choice. The four-point questionnaires were used for the experts' validation and to determine the usability of the TamTol Kit construction for form one integer topics. Table 3 below shows the scale used.

TABLE III
FOUR-POINT LIKERT SCALE USED FOR THE USABILITY OF TAMTOL KIT CONSTRUCTION FOR FORM ONE INTEGER TOPICS.

Level	Abbreviation	Score
Strongly Agree	SA	4
Agree	A	3
Disagree	D	2
Strongly Disagree	SD	1

The findings of study and discussion

(a) Validity of TamTol Kit

Based on the feedbacks and comments from the expert group, the item placement according to the specified construct would be maintained if the CVI for each item (I-CVI) is calculated by dividing the total number of experts who had evaluated the items with a score of 3 or 4 by the number of experts participating in this study. This means that the I-CVI is calculated by dividing the total I-CVI score by the number of items. The CVI for scale (S-CVI) is calculated by dividing the number of experts who had evaluated the items with a score of 3 or 4 by the total number of items. The I-CVI and S-CVI> 0.80 are considered acceptable (I-CVI ≥0.78 and S-CVI ≥0.90 are good) [8]. Table 4 shows the overall values of the instrument evaluation panel. Scores 3 and 4 are denoted by 1 to represent the experts' agreement.

TABLE IV
OVERALL VALUE OF THE PANEL OF ASSESSORS ON THE DEVELOPMENT OF TAMTOL KIT FOR INTEGER TOPICS FOR FORM ONE STUDENTS

No	Item	Experts			I-CVI
		1	2	3	
1	The use of this TamTol Kit is suitable for form one students.	1	1	1	1
2	This TamTol Kit can be used in TL sessions.	1	1	1	1
3	This TamTol Kit is easy to carry.	1	1	1	1
4	The use of this TamTol Kit is seen as capable of improving the students' understanding.	1	0	1	0.67
5	This TamTol Kit is easy for teachers and students to use.	1	1	1	1
6	The size of this TamTol Kit is very suitable for use.	1	1	1	1
7	This TamTol Kit applies the context accurately.	1	0	1	0.67
8	The use of this TamTol Kit has the potential to attract students to learn mathematics.	1	1	1	1
9	The use of this TamTol Kit has the potential to improve students' thinking skills.	1	1	1	1
10	The use of this TamTol Kit has the potential to help teachers to the achieve learning outcomes.	1	1	1	1
Total I-CVI					9.34
S-CVI					0.93

Overall, the value of S-CVI is 0.93, which is above the acceptable value of 0.90. Therefore, the findings of the study indicate that the expert panel's agreement on the usability of the TamTol Kit is high.

(b) Demographics

The findings and discussion section will describe the findings of the study on the information that had been gathered. For the demographic information of the respondents, the demographic factors discussed were gender, race, semester of study, as well as KPD3016 and KPD3026 courses.

The results of the data analysis show that the number of male respondents was 22 (23.9%), while 70 (76.1%) were female. The sample consists of a diversity of races, where 79 (85.9%) are Malays, 6 (6.5%) are Chinese, 2 (2.2%) are Indians, 3 (3.3%) are Ibans, 1 (1.1%) is Melanau and another 1 (1.1%) is of Sarawak indigenous race. As for the semester of study, the 2 groups that had been involved in this study consisted of 51 people (55.4%) from semester 6 and 41 people (44.6%) from semester 7, in which all are from the Bachelor of Education

(Mathematics). Specifically, the respondents involved in this study are from the Mathematics option who had taken the subjects KPD3016 and KPD3026.

(c) Perceptions of the Trainee Mathematics Teachers on the Construction of TamTol Kit for Integer Topics for Form One Students

After the data were obtained from the questionnaire provided, the data analysis shows that the trainee mathematics teachers' perception of the construction of the TamTol Kit was positive. Table 5 shows the complete details of the conducted analysis results.

TABLE V
ANALYSIS OF MEAN, FREQUENCY AND PERCENTAGE OF TRAINEE TEACHERS' PERCEPTIONS OF THE CONSTRUCTION OF TAMTOL KIT FOR INTEGER TOPICS FOR FORM ONE STUDENTS.

No	Items	SD	D	A	SA	Mean
1	This TamTol Kit can provide new ideas in helping me to deliver the teaching process.			30 32.6%	62 67.4%	3.67
2	This TamTol Kit provides a true picture of learning.			31 33.7%	61 66.3%	3.66
3	This TamTol Kit seems to work well.			31 33.7%	61 66.3%	3,66
4	This TamTol Kit meets my needs in teaching and facilitating sessions.			38 41.3%	54 58.7%	3.59
5	The color used on the TamTol Kit is appropriate.		3 3.3%	51 55.4%	38 41.3%	3.38
6	The use of this TamTol Kit is appropriate for the learning content.			28 30.4%	64 69.6%	3.70
7	The TamTol Kit size is suitable and easy to carry.			26 28.3	66 71.7%	3.72
8	Through videos, I understand how to use this TamTol Kit.			24 26.1%	68 73.9%	3.74
9	This TamTol Kit looks easy to use.			24 26.1%	68 73.9	3.74
10	This TamTol Kit looks user-friendly.			28 30.4%	64 69.6%	3.70
11	The design of this TamTol Kit is easy to manipulate.		2 2.2%	29 31.5%	61 66.3%	3.64
12	I can handle this TamTol Kit myself in solving questions.			21 22.8%	71 77.2%	3.77
13	I would suggest the idea of using this TamTol Kit to my friends.			33 35.9%	59 64.1	3.64
14	I feel excited to use this TamTol Kit.		1 1.1%	36 39.1%	55 59.8	3.59
15	The material used to build this TamTol Kit is safe to use.			15 16.3%	77 83.7%	3.84
16	I believe it can increase students' interest in learning mathematics.			38 41.3%	54 58.7%	3.59
17	I am sure students do not feel bored when using this TamTol Kit.			36 39.1%	56 60.9%	3.61
18	I hope other topics also have kits like this.			31 33.7%	61 66.3	3.66
19	The design of this TamTol Kit is interesting.		3 3.3%	33 35.9%	56 60.9%	3.58
20	I believe students are more eager to learn.			30 32.6%	62 67.4%	3.67
	Average Mean					3.66

Table 5 shows the 20 items used to measure the perceptions of trainee mathematics teachers on the usability of TamTol Kit for integer topics for form one students. On the whole, the mean scores of the trainee teachers' perceptions of the TamTol Kit usability are high, ranging from 3.38 to 3.84. The overall mean score of the trainee teachers' perceptions is 3.66. The lowest mean value is 3.38, which is for item 5 (“The color used on the TamTol Kit is appropriate.”). Meanwhile, the highest mean value is 3.84, which is for item 15 (“The material used to build this TamTol Kit is safe to use.”). Generally, the average mean value is 3.66, which is at a high level of agreement. This indicates that in general, all respondents have a good perception of the usability of the TamTol Kit.

Based on the analysis made, the trainee teachers gave a positive effect and excellent support to the usability of the TamTol Kit. The constructed TamTol Kit received comments regarding the acceptance of the trainee teachers who stated that the TamTol Kit has interesting features and realistic ideas, and makes fun TL. It is also easy to

understand, is critical, creative, complete with manuals, and is practical to use in the mathematics TL sessions. In addition, there were some views from the trainee teachers mentioning that the usability of this TamTol Kit is more suitable for moderate and weak student levels, as well as for basic mathematics TL. Nevertheless, it is important because by using this teaching aid, the trainee teachers can deliver their lessons easily and attract the students' attention. The construction of this TamTol Kit will also indirectly make students more focused and thus, it is easier for them to understand the concept of integers.

Essentially, for its advantages, this TamTol Kit received a very good view; it is complete, a beautiful and neat kit, and also, innovative. Some suggestions for improvement were also mentioned such as this TamTol Kit should be larger for a more attractive look, use various colors on the kit, and use different colors for the symbol of addition and subtraction operations. There was also a suggestion that this TamTol Kit need a template in A4 paper version for students to use in the classroom. Therefore, the TamTol Kit construction is very successful because each item used in the TamTol Kit meets the needs and wants of the students in solving the problems encountered.

CONCLUSION

A mathematics teacher should be skilled in identifying and making decisions to select the most effective teaching aids, optimizing resources to achieve the planned learning outcomes, and helping to stimulate the students' minds in mastering the subject. On the other hand, students' learning is much easier and more effective with the use of the teaching aids or games than conventionally learning mathematics using the chalk and talk way. Based on the previously-discussed problem statement, the objective of this study is to build a TamTol Kit for satisfactory validity on integer topics for form 1 students and satisfactory trainee teacher's perceptions of the TamTol Kit's usability on form 1 integer topics. In terms of the acceptance of the trainee teachers, the TamTol Kit was reviewed as having interesting features, easy to understand, equipped with guidelines, creating fun TL, realistic, critical, creative and comprising practical ideas to be applied in the mathematics TL. In addition, there were some views from the trainee teachers mentioning that the TamTol Kit's usability is more suitable for moderate and weak student levels, as well as basic mathematics TL sessions. The suggestions for improvement were also mentioned such as building a larger TamTol Kit for a more attractive look, diversifying the colors on the kit, and using different colors for the symbols of addition and subtraction operations. Therefore, the construction of the TamTol Kit is regarded as very successful as each item used in the TamTol Kit was well-received by the trainee teachers who responded to each item provided.

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