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Content Validity, Acceptability And Efficacy Of The Developed Self-Instructional Module (SIM) In Grade 8 Mathematics

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ABSTRACT

There's no doubt that contextualizing learning materials can dramatically boost teaching-learning outcomes. Contextualized learning materials build upon a similar concept of putting academic activities into perspectives of achieving the best learning outputs. This was the primary objective of this study which tested the content validity, acceptability and efficacy of the self-instructional module (SIM) in Grade 8 Mathematics. Quasi-experimental research design was employed. Adopted survey questionnaire was distributed to the first set of respondents of Mathematics teachers and senior high school students. The developed self-instructional module (SIM) registered a high content validity and acceptability. Experimentation of four weeks was done. The control group was subjected with traditional learning materials and the experimental group was exposed to self-instructional module (SIM). Pre-test results showed that the two groups under experimentation had the same level of academic achievement. After their exposure to two different types of learning materials, experimental group registered a very satisfactory academic achievement compared with the control group which acquired only a satisfactory academic achievement. This study proved that Supplemental Learning Materials in Mathematics were valid, acceptable and effective in improving the Higher Order Thinking Skills (HOTS) of students. Thus, the contextualized self-instructional module (SIM) should be adopted by the Grade 10 Mathematics teachers.

INTRODUCTION

Despite the struggles of the government to uplift the quality of education in the country, the problems of basic education have still become worse. Various innovations and reform programs of the curriculum were introduced. Yet, same problem continues to occur (Gegone, 2020). Poor quality of learning has been a big challenge in the four corners of the classrooms particularly in Mathematics. This is evident in the quarterly report of the School Guidance Office that the Mean Percentage Scores (MPS) of students in Mathematics are far behind from other subjects. Students' poor performance in the senior high school Mathematics is also a challenge to improve the quality of education in the junior high school Mathematics curriculum (Abdullah, 2020).

Maliga (2018) stressed that relative to the full implementation of the new curriculum, inadequacy of contextualized instructional materials in Mathematics is evident. Due to this, it is essential to introduce mathematics concepts through self-instructional module (SIM) that will encourage the use and synchronization of both minds and hands. Simpal (2020) stated that instructional materials should involve various practical work activities that engage the students' senses through dynamic activities that guide them to use what they already know, to learn more new complex lessons.

Thus, this research is an answer to the shortage of localized instructional materials which are well-matched to the culture and learning styles of students. Further, these contextualized self-instructional module (SIM) encourage both the fast and slow learners to apply thinking abilities in developing their problem-solving skills in Mathematics.

CONCEPTUAL FRAMEWORK

Brown (2009) as stressed by Tan-Espinar and Ballado (2016) stated that effective teaching requires understanding of what the students know and need to learn and inspiring them to acquire it well. To be effective, teachers need to understand and be committed to their students. Supplemental Learning Materials provide students with sufficient ideas and practices which frame classroom interactions via differentiated practical work activities. Sometimes, students are not really learning. It is because there are teachers who fail to realize the importance of developing instructional materials. When learning is channeled into enjoyable self-instructional module (SIM), students are very willing to invest considerable time and effort in answering it.

Testing the validity, acceptability and efficacy of the self-instructional module (SIM) plays a crucial role to have available valid and reliable localized instructional materials which enhance the thinking skills of students in Mathematics.

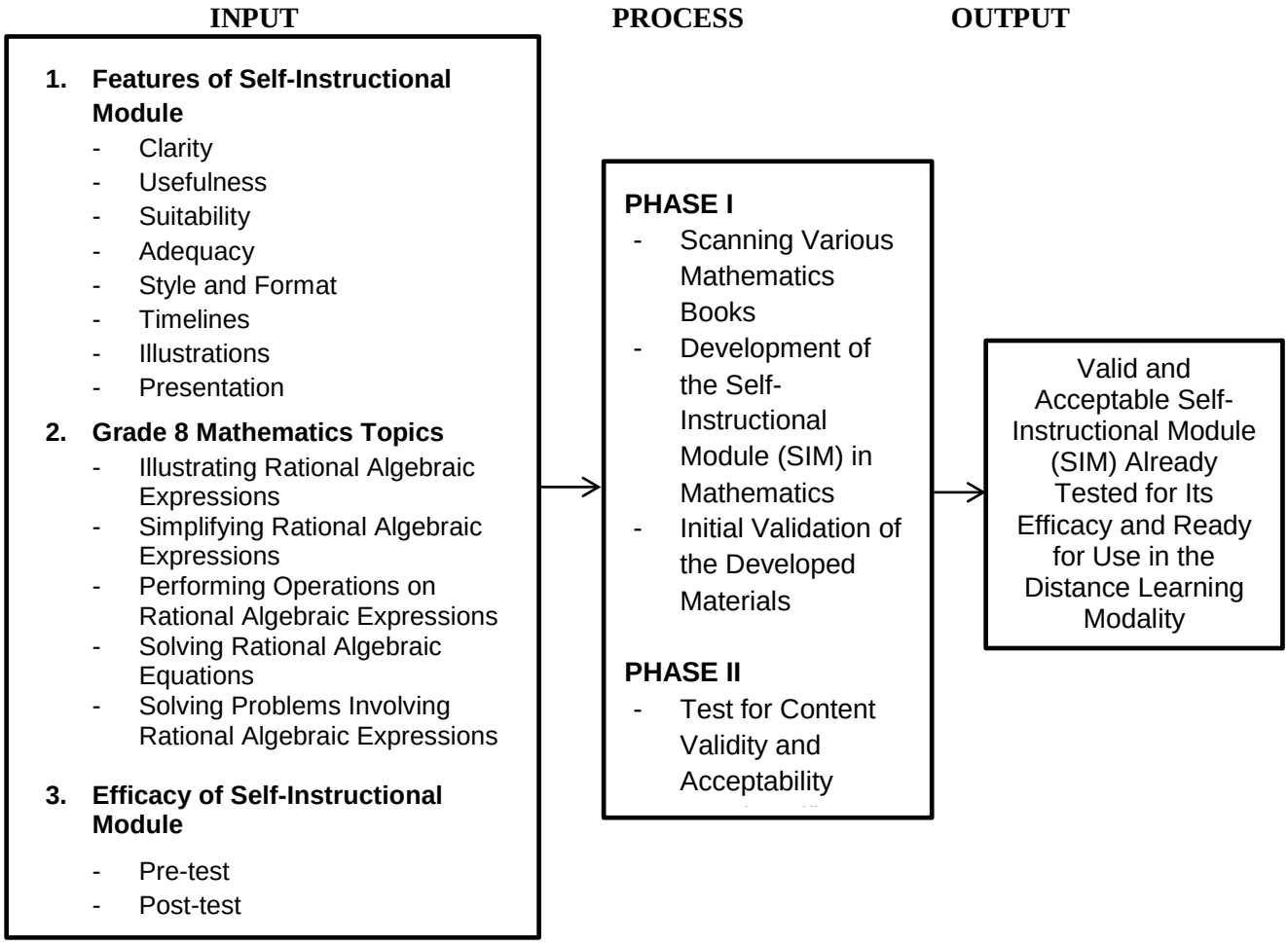

Figure 1. Research Model

STATEMENT OF THE PROBLEM

This study was carried out to test the content validity, acceptability and efficacy of the developed self-instructional module (SIM) in Mathematics.

Specifically, it sought answers to the following questions:

1. To what level is the content validity and acceptability of the self-instructional module (SIM) in terms of:

1.1 Clarity;
1.2 Usefulness;
1.3 Suitability;
1.4 Adequacy;
1.5 Style and Format;
1.6 Timelines;
1.7 Illustrations; and
1.8 Presentation?

2. To what level is the academic achievement of experimental and control groups before and after the experimentation in the following first quarter topics:
   2.1 Illustrating Rational Algebraic Expressions;
   2.2 Simplifying Rational Algebraic Expressions;
   2.3 Performing Operations on Rational Algebraic Expressions;
   2.4 Solving Rational Algebraic Equations; and
   2.5 Solving Problems Involving Rational Algebraic Expressions?
3. Is the academic achievement of students exposed in the following instructional materials significantly different after the experimentation of the study:
   3.1 Traditional Learning Materials, and
   3.2 Self-Instructional Module (SIM)?
4. Is the use of self-instructional module (SIM) effective in improving the academic achievement of students in Mathematics?

METHODOLOGY

Research Design

The study utilized a combination of descriptive and quasi-experimental research design since adopted survey questionnaire was employed to determine the content validity and acceptability level of the developed self-instructional module (SIM) in Mathematics and experimentation stage was conducted to test the efficacy of the materials.

Respondents of the Study

The respondents of this study were the selected Grade 9 students and all Mathematics teachers both from junior and senior high school of Mindanao State University-Maguindanao for the Academic Year 2020 – 2021 to answer the survey questionnaires on content validity and acceptability of the self-instructional module (SIM). Further, two sections of Grade 8 students were the final respondents to test the efficacy of the localized self-instructional module (SIM) in Mathematics.

Data Gathering Methods

Adopted survey questionnaire from the study of Tan-Espinar and Ballado (2017) was employed in determining the content validity and acceptability level of the developed self-instructional module (SIM) in Grade 8 Mathematics. The following scale was used to determine the content and acceptability level of the localized instructional materials: 4.20 – 5.00 = Very Much Valid and Acceptable, 3.40 – 4.19 = Much Valid and Acceptable, 2.60 – 3.39 = Valid and Acceptable, and 1.80 – 2.59 = Less Valid and Acceptable and 1.00 – 1.79 = Least Valid and Acceptable.

Further, 50-item researcher-made test instrument validated by reliable Mathematics jurors was administered to two groups under experimentation to determine the effectiveness of the self-instructional module (SIM) in teaching Grade 8 Mathematics. The students' scores in the pre-test and post-test were converted into Mean Percentage Score (MPS) and were dichotomously categorized, described and interpreted following the criteria adopted from National Educational Testing Research Council (NETRC).

Mean Percentage Score (MPS)	Descriptive Rating
96 – 100	Mastered (M)
86 – 95	Closely Approaching Mastery (CAM)
66 – 85	Moving Towards Mastery (MTM)
35 – 65	Average Mastery (AM)
15 – 34	Low Mastery (LM)
5 – 14	Very Low Mastery (VLM)
0 – 4	Absolutely No Mastery (ANM)

RESULTS AND DISCUSSION

This section presents, analyses and interprets data categorically arranged according to the order of the statement of the problem.

Content Validity and Acceptability of the Developed Self-Instructional Module (SIM)

Table 1 presents the level of the content and acceptability of the developed self-instructional module (SIM) in Grade 8 Mathematics.

Table 1. Level of the Content Validity of the Supplemental Learning Materials

Indicators	Mean	Description
Clarity	4.01	Much Valid and Acceptable
Usefulness	4.23	Very Much Valid and Acceptable
Suitability	3.89	Much Valid and Acceptable
Adequacy	3.88	Much Valid and Acceptable
Style and Format	4.19	Much Valid and Acceptable
Timelines	4.00	Much Valid and Acceptable
Illustrations	3.80	Much Valid and Acceptable
Presentation	4.21	Very Much Valid and Acceptable
Overall Mean	**4.04**	**Much Valid and Acceptable**

Legend:

4.20 – 5.00	Very Much Valid and Acceptable
3.40 – 4.19	Much Valid and Acceptable
2.60 – 3.19	Valid and Acceptable
1.80 – 2.59	Less Valid and Acceptable
1.00 – 1.79	Least Valid and Acceptable

As shown, the overall mean of 4.04 described as *Much Valid and Acceptable* means that the developed self-instructional module (SIM) in Grade 8 Mathematics had been scrutinized and checked by the teachers and passed the level of interest of students. This means that the contents such as practical exercises of contextualized module had already been refined to make them friendly with the target users.

Taking the data singly, the highest mean of 4.23 (*Very Much Valid and Acceptable*) was registered by the indicator *"Usefulness"*. This denotes that the instructional module prepared the students to think logically and critically since they utilized the localized examples in their day-to-day activities. On the other hand, the

indicator *"Illustrations"* acquired the lowest mean of 3.80 (*Much Valid and Acceptable*). This means that illustrations in the materials should be enhanced to make them more appealing to the target users.

This study is consistent with the study of Abdullah (2020) who found out that the supplemental learning materials in mathematics he developed were rated valid and acceptable by the students and math teachers. He suggested that any instructional material intended for the students should undergo validation and acceptability tests so that it can cater the needs of diverse backgrounds of the students. Maliga (2018) also confirmed this research findings when he stressed that valid and acceptable learning materials are free from conceptual errors.

Academic Achievement of the Students

Since the developed self-instructional module (SIM) was proven valid and acceptable to the target users, test of its efficacy was done. Tables 2 through 3 present the data obtained from the experimentation.

Table 2. Academic Achievement of the Students in the Control Group Before and After the Experimentation

Topics	Before		After	
	MPS	Description	MPS	Description
Illustrating Rational Algebraic Expressions	26.50	LM	80.80	MTM
Simplifying Rational Algebraic Expressions	22.40	LM	78.60	MTM
Performing Rational Algebraic Expressions	18.60	LM	72.40	MTM
Solving Rational Algebraic Equations	17.50	LM	71.50	MTM
Solving Problems Involving Rational Algebraic Expressions	22.80	LM	79.80	MTM
Overall MPS	**21.56**	**LM**	**76.62**	**MTM**

Legend:

96 – 100	Mastered (M)
86 – 95	Closely Approaching Mastery (CAM)
66 – 85	Moving Towards Mastery (MTM)
35 – 65	Average Mastery
15 – 34	Low Mastery (LM)
5 – 14	Very Low Mastery
0 – 4	Absolutely No Mastery

As can be glimpsed from the table, the overall MPS of 21.56 percent described as *Low Mastery* was registered by the pre-test and 76.62 percent was acquired by the post-test. This means that students in the control group had no prior knowledge in the first quarter topics. Yet, after their exposure to traditional teaching approach, their academic achievement increased to *Moving Towards Mastery (MTM)* from *Low Mastery (LM)*.

This research finding is consistent with the study of Paculanan (2013) who found out that control group received a low performance in Mathematics prior to the conduct of his experiment. Abdullah (2020) also supports the above data when he ascertained that students in control group had a very minimal idea in Math topics before he started the experimentation stage of his study. The two researchers agreed that receiving low scores in the pre-test is just a normal case of experimental research since most students have no idea yet about the topics.

Table 3. Academic Achievement of the Students in the Experimental Group Before and After the Experimentation

Topics	Before		After	
	MPS	Description	MPS	Description
Illustrating Rational Algebraic Expressions	24.60	LM	90.20	CAM
Simplifying Rational Algebraic Expressions	23.20	LM	88.50	CAM
Performing Rational Algebraic Expressions	16.80	LM	87.60	CAM
Solving Rational Algebraic Expressions	18.40	LM	89.20	CAM
Solving Problems Involving Rational Algebraic Expressions	20.50	LM	89.40	CAM
Overall MPS	**20.70**	**LM**	**88.98**	**CAM**

Legend:

96 – 100	Mastered (M)
86 – 95	Closely Approaching Mastery (CAM)
66 – 85	Moving Towards Mastery (MTM)
35 – 65	Average Mastery
15 – 34	Low Mastery (LM)
5 – 14	Very Low Mastery
0 – 4	Absolutely No Mastery

As shown, the academic performance of students in the experimental group improved from *Low Mastery (LM)* to *Closely Approaching Mastery (CAM)* as the pre-test and post-test of the students obtained MPS of 20.70 percent and 88.98 percent, respectively. This means that the exposure of the students with self-instructional module (SIM) helped them to master the first quarter lessons in Grade 8 Mathematics.

Although, both control and experimental groups registered increase in the level of academic achievement, the latter had a higher increase of learning output and it was attributed to the fact that students in the experimental group were motivated to solve the problems which were incorporated by practical work activities (PWA).

Similar research finding is emphasized by Maliga (2018) who found out that students exposed with supplemental learning materials in Grade 10 Mathematics had better Mathematics performance after the experimentation compared with the control group subjected with traditional method of instruction. He suggested that Mathematics teachers should expose their students in different modern collaborative learning approaches supplemented with contextualized instructional materials (IM's).

Table 4. t-test Analysis on the Academic Achievement of Students Before and After Experimentation

Types of Instructional Materials	Before	After	$t_{computed}$	$t_{critical}$	p-value
Traditional Learning Materials	21.56	76.62	10.268*	1.98	0.021
Self-Instructional Module (SIM)	20.70	88.98	32.0125**	1.98	0.000

** - significant @ 0.01 level * - significant @ 0.05

Findings revealed that the academic achievement of students exposed with traditional learning materials had a significant increase from 21.56 percent to 76.62 percent as denoted by the computed t_{value} of 10.268 which is greater than the critical t_{value} of 1.98 (p-value = 0.021 < 0.05). The academic achievement of the students exposed with the validated self-instructional module (SIM) had registered a very substantial

improvement form 20.70 percent to 88.98 percent and it was strongly affirmed by the computed t_{value} = 30.0125 > critical t_{value} = 1.98 (p-value = 0.000 < 0.01).

This finding means that the exposures of students in the two different learning materials boost their academic achievement. This study is consistent with the study of Paghubasan (2017) who found out that those students in experimental group registered higher improvement in their performance and retention in Mathematics after their exposure to game-based and activity-oriented instruction. She also concluded that although students exposed with both traditional instruction and game-based and activity-oriented instruction recorded an increase in their Mathematics performance and retention, experimental group had higher mean gain score compared with the control group.

To determine if the self-instructional module (SIM) was more effective than the traditional learning materials, Table 4 presents the final t-test analysis.

Types of Instructional Materials	MPS	$t_{computed}$	$t_{critical}$	p-value
Traditional Learning Materials	76.62	32.105**	1.98	0.000
Self-Instructional Module (SIM)	88.98			

** - significant @ 0.01 level

As shown, self-instructional module (SIM) was more effective than the traditional learning materials since the computed t_{value} = 32.105 is greater than the critical t_{value} = 1.98 (p-value = 0.000 < 0.01). This means that the differentiated instructional activities found in the self-instructional module (SIM) really boost the Higher Order Thinking Skills (HOTS) of the students and appreciate the importance of Mathematics.

The above statistical analysis is supported by Abdullah (2020). He concluded that students confined with traditional mathematics instruction registered a minimal progress in their problem-solving performance compared to the students who were exposed to self-instructional module (SIM). He stressed that self-instructional materials maximizes students' learning opportunities since it is composed of practical work activities for the tutors and tutees.

This study is consistent with the idea of Abdullah (2020) and Paculanan (2013) who emphasized that modern teaching approaches and learning materials let the students to relate Mathematics principles to practical situations happening in the community. They also noted that use of modern technology should be emphasized to the students so that they will not become ignorant of the recently invented devices and mobile applications of the modern world.

CONCLUSION AND RECOMMENDATION

Before the start of the experimentation, students both from control and experimental groups had no prior ideas about the first quarter lessons in Grade 8 Mathematics. After their exposures to traditional learning materials and self-instructional module (SIM), respectively, both groups registered a significant improvement in their academic achievement. Yet, post-test scores of students in experimental group were significantly higher than those in control group. This proved that self-instructional module (SIM) was not only valid and acceptable, but its effectiveness was very high in enhancing the academic achievement of students.

To reduce the anxiety of students in Mathematics, teachers should use authentic materials, and anchor teaching on the context of learners' lives. Thus, the developed self-instructional module (SIM) in this study should be adopted by the Mathematics teachers in Maguindanao.

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