THE POTENTIAL OF SELF-LEARNING MODULES TO DEVELOP MATHEMATICAL REPRESENTATIONS AND CONNECTIONS IN DISTANCE LEARNING

Usman P. Bandala[1], Modjahidin P. Bandala[2], Leorence C. Tandog[3]

[1] *Public Elementary School Teacher, Department of Education, Amas Central Elementary School, Barangay Amas, Kidapawan City, Philippines*
[2] *Public Secondary School Teacher, Department of Education, Amas National High School, Barangay Amas, Kidapawan City, Philippines*
[3] *Professor VI, Dean, Graduate School, University of Southern Mindanao, Kabacan, Province of North Cotabato, Philippines*

ABSTRACT

The use of self-instructional materials was employed among elementary school learners for learning continuity amidst pandemic where face to face instruction is prohibited. In this study, the researchers identified the features of representation and connections in the said instructional materials; the level of help the learning material offered as perceived by the learners; and the experiences of the learners on the use of self-instructional materials. Document analysis was done to 27 self-instructional materials in Mathematics 6 in order to find out the features; survey questionnaire was used to gather data from the grade 6 pupils who served as respondents to assess the level of help the self-instructional materials offer to them; and 10 pupils participated in the interview to account the experiences of the learners on the use of the said materials. The findings revealed that in terms of representation, visual representations were found in the sample activities and exercises in majority of the modules; however, these are seldom found in the assessment section. In terms of connection features, most of the connection features found in the sample activities, exercises and assessments are connections to real life situations. Meanwhile, the pupils consider the representations and connection features of the materials as helpful. The shared experiences of the pupils in the use of the self-instructional materials in Mathematics include: difficulty in learning from the self-instructional materials; lack of guidance in learning from the modules; self-fulfillment in learning; loss of interest in learning/demotivation.

Keyword *Connections, distance learning, experiences, interrupted face to face instruction, representations, self-instructional material or module***.**

1. INTRODUCTION

The recent pandemic is a crisis challenging the education sector to find ways of ensuring learning continuity without the conventional face to face teaching and learning environment. There is firm mandate of the President that face-to-face classes should be prohibited unless the vaccine for Covid 19 is available. In response to this, the Department of Education (DepEd) issued the Memorandum Order No. 012 series of 2020, the Adoption of the Basic Education Learning Continuity Plan for School Year 2020-2021 in the Light of the COVID-19 Public Health Emergency. The memorandum mandates the schools to deploy different learning modalities for learning continuity.

There are many options for learning continuity and online learning, or distance education is one of those. However, in the Philippines, particularly in the rural areas, internet connection is a problem; hence, online class as one of the options, is also challenging for both teachers and learners. Modular approach with the use of the Self-Instructional Learning Materials, is designed for self-instruction to attain learning objectives. It directs learners to

practice information; gain mastery of the concepts with the exercises given following the progression of activities (Nardo, 2017) [1].

It is indeed an acceptable fact that due to the natures of mathematics education, it can be better facilitated through face-to-face classes. Mathematics necessitate learners to have a grasp of what the abstract materials in mathematics are and connect their experiences to such. On the part of the teachers, they need to decompress and unpack the mathematics concepts for the students not to find it difficult to learn. Hence, teachers need to employ various strategies related to action learning and motivation and use motivating tools for learning mathematics (Abramovich, Grinshpan & Milligan, 2019) [2].

The K to 12 Curriculum for Mathematics particularly for the Grade 6 pupils clearly presented the learning standards stated as: "the learner demonstrates understanding and appreciation of key concepts and skills involving numbers and number sense using appropriate technology - in critical thinking, problem solving, reasoning, communicating, making connections, representations, and decisions in real life". In the context of Mathematics learning where demonstrations, illustrations and manipulatives are necessary in order of the learners to grasp the important mathematics processes, what then these instructional materials can do and will do to be able to help elementary school learners learn such processes?

Sejpal (2013) [3] claimed that self-instructional materials are more appropriate for mature learners. However, many schools implement the modular learning approach. In Kidapawan City Division particularly at Amas Central Elementary School, self-instructional learning materials are distributed to leaners. But as widely accepted fact, there is no approach in learning that fits all. There is question as to the potential of these materials to develop mathematical representations and connections among the pupils who are not directly in contact with the teachers for face-to-face instructions or classes. In addition, how do learners view the helpfulness of these materials in their learning?

The researchers noticed that there are limited literature pointing out the use of self-instructional materials in mathematics for elementary learners. With the use of such materials among the elementary pupils, the researcher finds it interesting to find out how these materials help learning mathematics processes. This research is very timely as educators and policy makers are trying their best to ensure that learning continuity is in place in the country. The researcher has not come across studies related to this since the phenomenon is new. This is the first school year where classes are interrupted for this longer length of time and teachers rely on the use of the instructional materials

1.1 Purpose of the Study

The purpose of this study was to explore the potential of the self-instructional materials to develop mathematical representations and connections. It also specifically accounted the perceptions of the pupils as to how helpful the learning materials are; and the experiences and challenges learners encounter while learning mathematics during the interrupted face to face instruction.

1.2 Research Questions

This study asked the following research questions:

1. What are the features of Self-Instructional Modules in Mathematics 6 in terms of visual representations and connections?
2. What is the level of help the Self-Instructional Modules in Math offers for the learners in terms of representations and connections?
3. What are the experiences of the learners while learning mathematics through the self-instructional materials?

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2. METHODOLOGY

This research employed both descriptive quantitative and qualitative research design. For Creswell, Plano Clark, Gutmann, and Hanson (2003) [4], the researchers can employ mixed method when there are research questions which can be better answered with the use of qualitative and quantitative data regardless of what data are largely gathered. It is also helpful when a researcher embeds within a quantitative design a qualitative aspect in the study.

In this study, quantitative design was applied in the research question which ask about the perceptions of the respondents on the extent of help the self-instructional materials in Mathematics offer for the elementary school learners during the interrupted face to face instruction. This can be assessed quantitatively since the respondents

rated the level of help the materials can give in learning mathematics process such as problem solving, reasoning and proof, representation and connections.

On the other hand, descriptive qualitative design was used for the research questions which ask about the experiences learners encountered while learning the self-instructional materials. Document analysis was also part of the qualitative design where the self-instructional materials were studied in terms of the features related to mathematical representations and connections.

3. RESULTS AND DISCUSSION

This section presents the findings of the study regarding the features of representations and connections in the module; the level of help of the module as perceived by the respondents; and the experiences of the pupils while learning the mathematics modules. This also presents the discussion of the findings; the implication for educational practice and future research.

3.1 Representation of the Mathematics 6 Self-Instructional Materials

The analysis of the representation features centered on two (2) aspects: the visual presentation of the concepts or lesson being taught with the use of pictures, illustrations, drawings, and other visuals; and the idiosyncratic presentation which refers to the presentation of concepts in pictures, illustrations, and drawings without number labels on them. The parts of the self-instructional materials being analyzed were categorized into sample activities, exercises and assessments consisting pre-assessment and the post assessment.

All the 27 modules in Grade 6 Mathematics were evaluated. Of these 7 (25.9%) did not use visual or idiosyncratic representations in parts of the modules evaluated. These 7 modules focused on solving routine and non-routine problems involving division without or with any of the other operations of fractions and mixed fractions, multi-step problems involving multiplication and addition or subtraction of decimals, dividing decimals up to 4 decimal places by 0.1, 0.01, and 0.001, differentiating repeating from terminating and non-terminating decimal quotient, solving multi-step problems involving division of decimals and any of the other operations, types of proportion and solving word problems on integer. All these mathematical concepts were presented in texts with no visual representation to facilitate learning.

Moreover, visual representation appeared only in sample activities and exercises part of the module. Under the assessments part, both the visual representations and idiosyncratic representations were not evident. A total of 20 (74.1%) from 27 modules were found to have representational features. Table 3.1 presents the representation features found in these self-instructional materials.

Table 3.1 Frequency of Mathematics 6 Self-Instructional Materials with Representation Features

Parts of the Self-Instructional Materials	Representations (n=27)					
	Visual		Idiosyncratic		Total	
	f	%	f	%	f	%
Sample Activities	19	70.37	1	3.7	20	74.1
Exercises	7	25.9	0	0	7	25.9
Assessments	0	0	0	0	0	0.0

As shown in the table, the sample activities have the highest percentage of occurrence in terms of visual representations where in 19 (70.37%) of 27 modules have these features. Meanwhile, 7 modules (25.9%) have visual representation in the exercises. All assessments in the 27 modules evaluated were not accompanied by both the visual representations and idiosyncratic representations.

Figure 1 shows a visual representation of one sample activity in the module. The sample word problem is being accompanied by a drawing meant to facilitate students' understanding of the problem context.

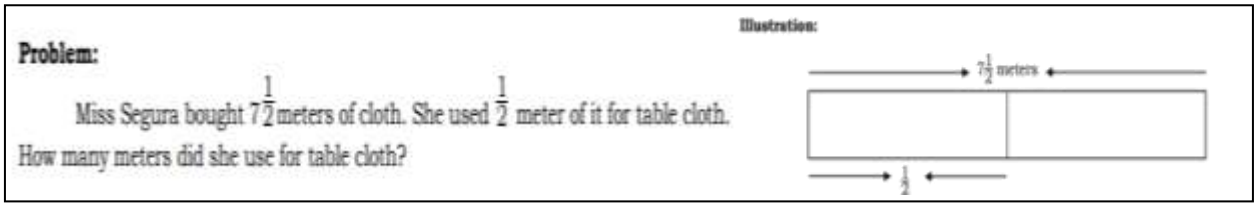


Figure 1. *Sample Visual Representation in the Sample Activities*

Figure 2 shows a sample visual representation from the exercises section of the SIM. In this sample the amount of money in the given problem is being reinforced with the visuals representing the amount of money.

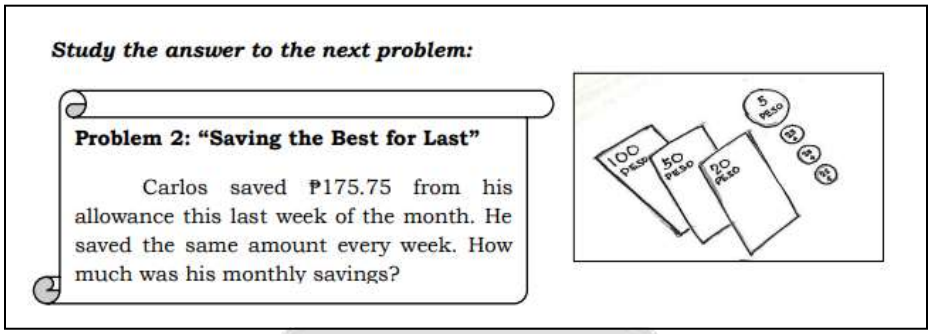


Figure 2. *Sample Visual Representation in the Exercises*

The idiosyncratic presentation only appeared in 1 module (3.7%). As to the idiosyncratic representation, this is how the representation appears as shown in Figure 3. This is considered as idiosyncratic since the representation is not labelled with the number of fruits as given in the word problem. This, however, appears only in 1 out of 27 modules.

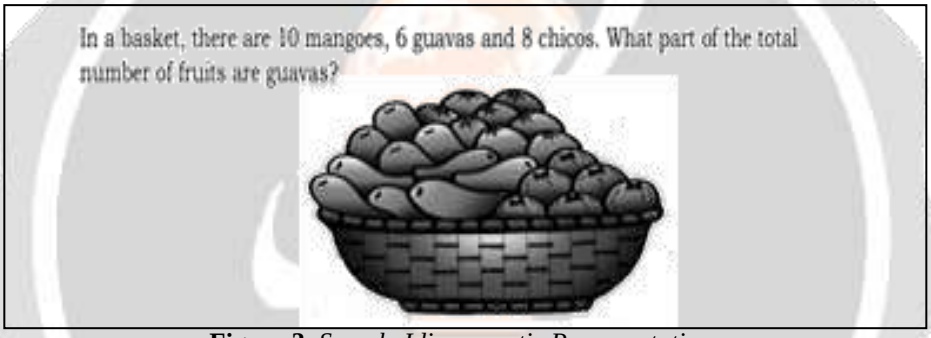


Figure 3. *Sample Idiosyncratic Representation*

3.2 Connection Features of the Mathematics 6 Self-Instructional Materials

Table 3.2 presents the frequency of occurrence of the connection features in the sample activities, exercises, and assessments of self-instructional modules in Mathematics 6. The parameters being used in the evaluation for this feature are the connection to the previous lesson, connection to real-life context, and the connection to different solution strategies.

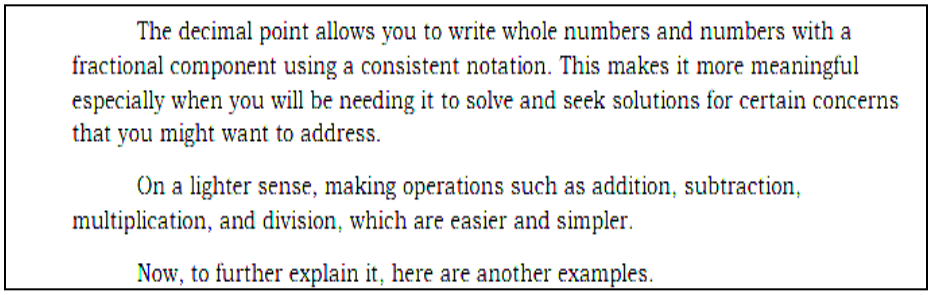
Table 3.2 Connection Features in the Mathematics 6 Self-Instructional Materials

Parts of the Self-Instructional Materials	Connection Features (n=27)					
	Connection to the previous lesson		Connection to real-life		Connection to different solution strategies	
	f	%	f	%	f	%
Sample Activities	16	59.26	20	74.07	11	40.74
Exercises	7	25.9	16	59.26	10	37.04
Assessments	0	0	15	55.56	0	0

Connection Features in Sample Activities. Connection features was found dominant in the sample activities part of the modules. For the sample activities, 16 modules (59.26%) features connection to previous lesson.

In figure 4, the lesson is about division of decimals. The sample activity shows a connection of the lesson to the previous topics. The material directed the learner to recall the concept about the decimal point; and tell the

learners to use their addition, subtraction, and multiplication knowledge in order to perform the division task during the presentation of the sample activities.



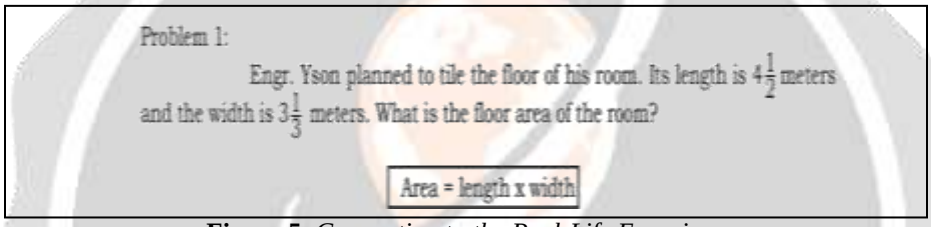
The decimal point allows you to write whole numbers and numbers with a fractional component using a consistent notation. This makes it more meaningful especially when you will be needing it to solve and seek solutions for certain concerns that you might want to address.

On a lighter sense, making operations such as addition, subtraction, multiplication, and division, which are easier and simpler.

Now, to further explain it, here are another examples.

Figure 4. *Sample on Connecting to the Previous Lesson*

Connecting math concepts to real-life is most evident in this part of the module with 20 (74.1%) self-instructional materials able to connect sample activities to real life. To connect to the real-life experiences or real-life context, the sample activities of the material appeared like the sample shown below where the material presents word problem using the numbers in math in a context that is based on the daily activities where the concept can be applied. In sample 5, the word problem is in the context of tiling the floor which is observable by learners and the dimension of the room which is also relatable.



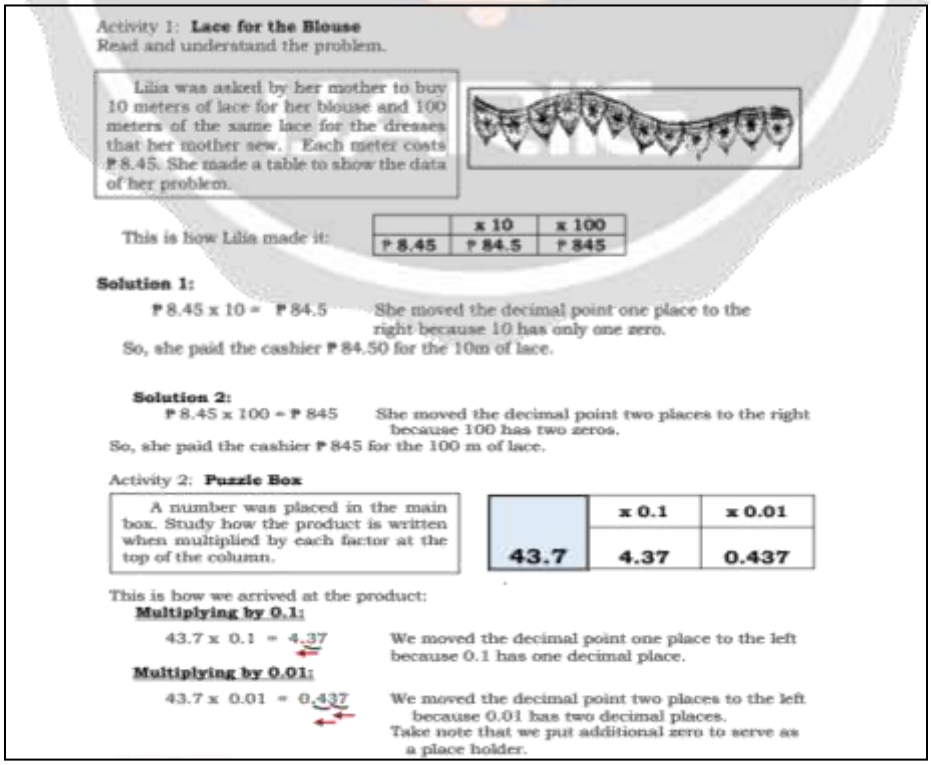
Problem 1:

Engr. Yson planned to tile the floor of his room. Its length is $4\frac{1}{2}$ meters and the width is $3\frac{1}{3}$ meters. What is the floor area of the room?

Area = length x width

Figure 5. *Connecting to the Real-Life Experiences*

Connection to the different solution strategies appear in the sample activities of 16 (59.26%). To show connection to the different solution strategies, the material presents the sample activities this way as shown in sample 6 where the material presented 2 ways to solve the problem in the sample activities.



Activity 1: **Lace for the Blouse**
Read and understand the problem.

Lilia was asked by her mother to buy 10 meters of lace for her blouse and 100 meters of the same lace for the dresses that her mother sew. Each meter costs ₱ 8.45. She made a table to show the data of her problem.

This is how Lilia made it:

	x 10	x 100
₱ 8.45	₱ 84.5	₱ 845

Solution 1:

₱ 8.45 x 10 = ₱ 84.5 She moved the decimal point one place to the right because 10 has only one zero.

So, she paid the cashier ₱ 84.50 for the 10m of lace.

Solution 2:

₱ 8.45 x 100 = ₱ 845 She moved the decimal point two places to the right because 100 has two zeros.

So, she paid the cashier ₱ 845 for the 100 m of lace.

Activity 2: **Puzzle Box**

A number was placed in the main box. Study how the product is written when multiplied by each factor at the top of the column.

	x 0.1	x 0.01
43.7	4.37	0.437

This is how we arrived at the product:

Multiplying by 0.1:

43.7 x 0.1 = 4.37 We moved the decimal point one place to the left because 0.1 has one decimal place.

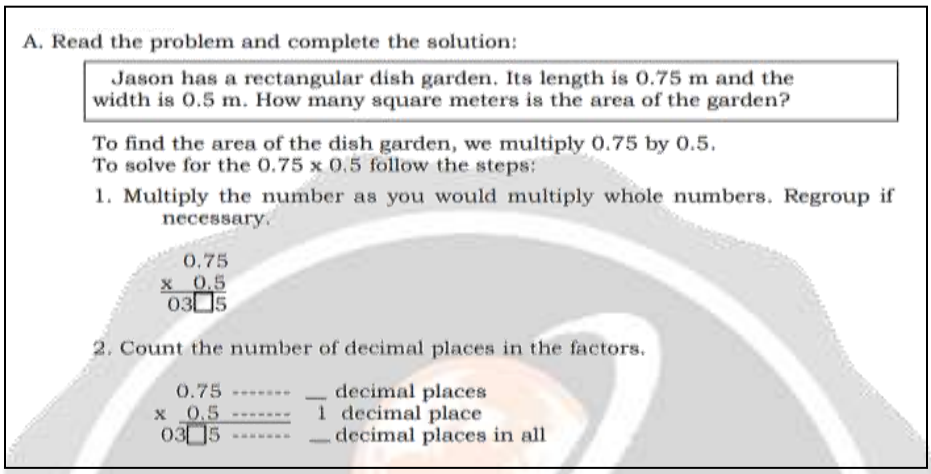
Multiplying by 0.01:

43.7 x 0.01 = 0.437 We moved the decimal point two places to the left because 0.01 has two decimal places. Take note that we put additional zero to serve as a place holder.

Figure 6. *Connecting to the Different Solution Strategies*

Figure 6. *Sample in the Sample Exercises Showing Connection to Solution Strategies*

Connection Features in Exercises. For the exercises part of the material, connection to the real-life has the highest percentage of appearance as it appears in 16 out of 27 modules (59.26%). The examples below show how the exercises exhibit connection to the previous lesson. In figure 7, the material makes use of the knowledge in the previous lessons (steps in solving the area and how multiplication of decimals is done) for the students to perform the presented exercises.



A. Read the problem and complete the solution:

Jason has a rectangular dish garden. Its length is 0.75 m and the width is 0.5 m. How many square meters is the area of the garden?

To find the area of the dish garden, we multiply 0.75 by 0.5.
To solve for the 0.75 x 0.5 follow the steps:

1. Multiply the number as you would multiply whole numbers. Regroup if necessary.

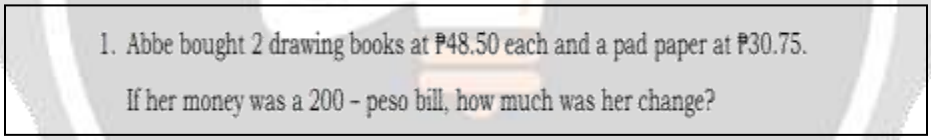
```
  0.75
x  0.5
 03□5
```

2. Count the number of decimal places in the factors.

```
0.75 ------- __ decimal places
x 0.5 ------- 1 decimal place
03□5 ------- __ decimal places in all
```

Figure 7. *Sample Exercises that Show Connection to the Previous Lesson*

10 modules are evident of showing connection to the different solution strategies (37.04%). The connection to real-life experiences is also evident some of the self-instructional materials' exercises. For instance, figure 8 presents the connection of the lesson to the real-life situation by presenting a worded problem in the context of buying a drawing book.

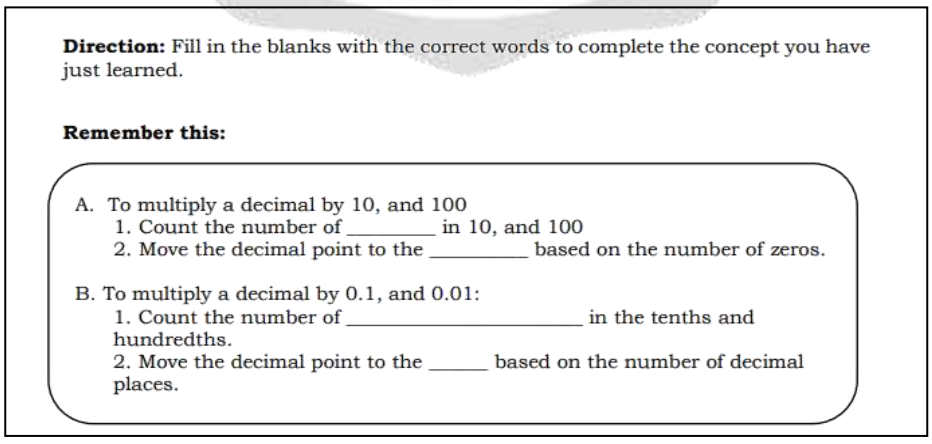


1. Abbe bought 2 drawing books at ₱48.50 each and a pad paper at ₱30.75.

If her money was a 200 – peso bill, how much was her change?

Figure 8. *Sample Exercise Connecting the Lesson to the Real-life*

The least is the connection to previous lesson were observed in the exercises of 7 modules (25.9%). To connect the exercises to the different solution strategies, figure 9 shows the different strategies in multiplying decimals based on the given and let the students recall those before the presentation of more exercises by including the "remember this section" to connect the two strategies when solving decimals.



Direction: Fill in the blanks with the correct words to complete the concept you have just learned.

Remember this:

A. To multiply a decimal by 10, and 100
   1. Count the number of _____ in 10, and 100
   2. Move the decimal point to the _____ based on the number of zeros.

B. To multiply a decimal by 0.1, and 0.01:
   1. Count the number of _____ in the tenths and hundredths.
   2. Move the decimal point to the _____ based on the number of decimal places.

Figure 9. *Connecting to Different Strategies*

Connection Features in Assessment. In the assessment part of the module, the only connection feature found is connection with real-life. Fifteen (55.56%) modules connected assessment to real-life applications. Connection to the previous lessons and connections to the different solutions strategies were not observed.

In the assessment, the word problem is presented in the context that is relatable for the leaners.

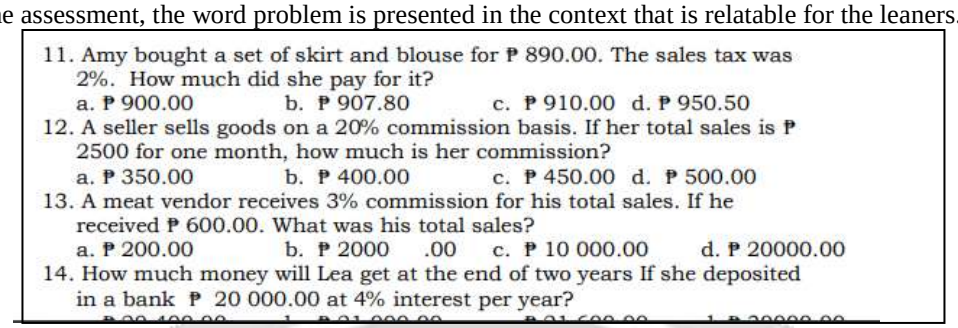

11. Amy bought a set of skirt and blouse for ₱ 890.00. The sales tax was 2%. How much did she pay for it?
a. ₱ 900.00 b. ₱ 907.80 c. ₱ 910.00 d. ₱ 950.50
12. A seller sells goods on a 20% commission basis. If her total sales is ₱ 2500 for one month, how much is her commission?
a. ₱ 350.00 b. ₱ 400.00 c. ₱ 450.00 d. ₱ 500.00
13. A meat vendor receives 3% commission for his total sales. If he received ₱ 600.00. What was his total sales?
a. ₱ 200.00 b. ₱ 2000 .00 c. ₱ 10 000.00 d. ₱ 20000.00
14. How much money will Lea get at the end of two years If she deposited in a bank ₱ 20 000.00 at 4% interest per year?

Figure 10. *Connecting to the Real-life Context*

This study revealed that the representation and connection features are not evident in all self-instructional materials being analyzed for this study. In terms of representation features, only the sample activities and the exercises parts of the material are showed with visuals; however, this does not appear in all modules. Observably, there are pictures presented in some modules, but these are not representations of the concepts or lesson being introduced or being practiced. It is also observed that the assessment sections of the modules do not have representation features. This means, the numbers are given as they are without illustrations for better understanding.

It can be gleaned from the results of the analysis that module developers or writers are not using visuals to supplement the explanation of the concept and to show representations of concepts to help facilitate understanding. Representation is linked to imagination; and thus, when there is representation, learners imagine, construct and retrieve information to aid learning (Lingefjärd & Ghosh, 2016) [5]. In the study of Kaswa (2015) [6], the use of visuals in presenting the lesson is one of the ways in improving the learning of the students.

In terms of connection features, the most prevalent feature is the connection of the concept to real-life context which appear in all parts of the module. This is manifested through the use of contextualized word problems in the sample activities, exercises and assessment. The results imply that the modules are designed in such a way that learners are able to find the usefulness of the lesson for their everyday life. Various types of math tasks are embedded in real context, such as word problems, story problems, math modeling and applications. Doing this in presenting mathematics lessons support the idea of Crooks and Alibali (2014) [7] who pointed out that showing connections in mathematics instruction will facilitate greater understanding as the learner connects or links ideas from one situation to another.

3.3 Level of Help of the Mathematics 6 Modules

This result is based on the perceptions of the Grade 6 pupils. This was also focused on the representations and connections features in the material. Table 3.2 presents the perception of the respondents on the level of help of the self-instructional materials' representation and connection features.

Table 3.3 Level of Help of the Self-Instructional Material as perceived by pupil respondents

Statement	Mean	Interpretation
Representations		
1. I enjoy learning through my modules because of the pictures it shows for me to learn.	3.44	Helpful
2. I can understand the lesson through illustrations.	3.32	Helpful
3. I can understand the lesson through the drawings and pictures.	3.30	Helpful
Connections		
1. I can connect different solution strategies.	3.24	Helpful
2. I can connect my Math lesson to my previous math topics.	3.18	Helpful

3.	I can connect a math topic to real-life contexts.	3.08	Helpful

Based on the evaluation of the representation and connection features of the self-instructional materials, there are representation features which may not be completely helpful as they lack the features which may aid student understanding of the concepts. It is emphasized by Fyfe et al (2015) [8] that mathematical concepts introduced through representation should be linked to concrete ideas and that the representation should be directly observable for this to become more understandable and aids learners in comprehending abstract mathematical concepts (Mitchell, Charalambous & Hill, 2014 [9]; Kang & Liu, 2018) [10].

The pupils' perceptions of the help that the mathematics module offered to them particularly the representations and connection features of the modules, showed that the material is helpful. This means, the pupils have oftentimes observed the way presentations and connections in the modules help them in learning. It can be deduced from the result that the module is perceived helpful for the pupils. There are studies which support that the module is helpful for learners while there are also studies which pointed out the disadvantages of using self-instructional materials. The material has to provide the student with full guidance in learning, in the absence of a teacher. The student should not struggle to master content when using self-learning materials of any type. On the negative side for instance, Sejpal (2013) [3] pointed out that the use of modules faces the challenge among younger learners because this is only appropriate only for matured students.

3.4 Experiences of Pupils in Using Mathematics 6 Self-Instructional Materials

The experiences of the pupils in using the mathematics self-instructional materials are presented in Table 3.3 showing the themes, and the core ideas. The themes include difficulty in learning from the self-instructional materials; lack of guidance in learning from the modules; self-fulfillment in learning; loss of interest in learning/demotivation.

Table 3.4 Themes and Core Ideas on the Experiences of Pupils in Using Mathematics 6 Self-Instructional Materials

Themes	Core Ideas
difficulty in learning from the self-instructional materials	• confusion as to what to answer • difficulty in understanding the lesson • some parts of the modules are difficult to learn
lack of guidance in learning from the modules	• inability to answer the modules alone • absence of adults at home to guide in learning
loss of interest in learning/demotivation	• boredom while learning • leaving behind the learning tasks
self-fulfillment in learning	• positive attitude towards learning from the modules

Difficulty in learning from the self-instructional materials. The difficulty in learning from the self-instructional materials is supported by the core ideas like the confusion of the pupils on what to answer in the tasks, activities and tests in the module. As revealed by one of the pupils being interviewed, she has difficulty in learning some parts of the lesson since she is in doubt of whether her answer is correct which is caused by her confusion of the lesson and as to what she will answer.

> *Naguguluhan ako sa kung ano ang isagot ko*. *Minsan naguguluhan dahil maraming i-solve*. (I am confused on what to answer. I am sometimes confused since I have a lot to solve.) **P2**

> *Maglibog ko sa akong ianswer usahay kay lisodan ko sa module*. (I am confused on what to answer because sometimes, I find the lesson difficult.) **P3**

Similarly, the experience of having difficulty in learning from the instructional materials is manifested with the difficulty the pupils have in understanding some lessons. As shared by the pupils, there are topics which they find difficult to understand.

> *…mahirapan ko sa lesson…mahirapan ko usahay sa kanang integers…ug sa mga problem pud*. (I find the lesson challenging…I find the topic about integers difficult and also those word problems.) **P12**

Another participant mentioned the topics on the operation involving integers as topics which are difficult for her.

> *Lisudan kaayo ko isaulo…katong sa positive ug negative nga i-add, i-minus, i-times ug i-divide*. (I find it really hard to memorize…the positive and negative…that should be added, subtracted, multiplied and divided.) **P11**

Related account of Participant 13 further explained the idea that the pupils are having difficulty in understanding their lesson and pointed out that the formula are not understandable.

> *…naay formula dili maintindihan…mas lahi if teacher mag-explain.* (There is a formula I cannot understand… it would be better if my teacher will explain it…) **P13**

Moreover, the participants also shared that some parts of the modules are difficult to understand. Aside from mentioning topics which are tough for them, Participant 15 elaborated the reasons why she experienced difficulty in learning:

> *Kanang daghan kaayo isulat ug isolve…naay itimes, tapos i-divide pa jud. Daghan answeran*…(There are plenty to write and solve…there are those which should be multiplied and divided…and there are a lot to answer.) **P15**

Lack of guidance in learning from the modules. The participants also shared that in learning the modules, they lack the guidance of those who are knowledgeable about the lesson so they can seek immediate help. This is explained by the ideas that pupils have inability to answer the modules alone; and some lack the self-directed learning readiness.

The pupils shared that while studying their modules, and they meet some difficulties, they got no one to call for help to explain the concept to them. One of the participants expressed this when ask about how is her learning through the module.

> *Okay lang pero kung mahirapan ako minsan, wala man magtabang sa akoa kay nagaluto man akong mama*. (It is ok but I find it difficult sometimes if no one could help me because my mother is cooking (doing household chores). **P3**

Similarly, Participant 1 and Participant 14 responded:

> *Ang pag-gamit ng math module ay medyo mahirap dahil ito ay nakasulat lang sa papel at hindi lubos na maunawaan dahil hindi naipapaliwanag ng mabuti sa amin*… (Using the module seems difficulty because it (the lesson) is only written in the paper and this could not be easily understood since there is no one explaining it.) **P1**

> *Wala koy ganahan sa module. Dili man ko kabalo muanswer kung walay magtudlo sa akoa*. (I do not like the module. I do not know how to answer if nobody will teach me how.) **P14**

Loss of interest in learning/demotivation. There are pupils who also shared that they loss the interest or they are demotivated to learn from the self-instructional materials. They expressed boredom in answering the modules:

> *Mabored po ako minsan sa pag-answer sa modules. Daghan man gud kaayo nagtapok nga answeran*. (I am sometimes bored in answering the modules since there are a lot to answer.) **P16**

Other pupils also revealed that they are not answering or they are not doing some parts of the modules. They are selective on what to do and what to answer.

> *Dili naku answeran ang uban…ang uban lang*. (I am not answering other parts of the module. Only some.) **P13**

Self-fulfillment in learning. While other themes generated on the experiences of the pupils are usually on the negative side, there are also positive experiences being shared by the pupils. They shared positive attitude towards learning the module. It is interesting to note, how Participant 1 revealed her realization about modular learning.

> *Mahirap sa simula…ngunit kung pag-aralan ng Mabuti…hanggang namalayan ko na madali lang pala maintindihan*. (It is challenging at first…but if you have to study carefully…then…I realized…it is easy to learn.) **P1**

> *Ang akong matun-an sa module sa Math kay pwede naku magamit sa tindahan…kanang mga sukli ug magkwenta pila ang gipalit*. (What I learned from the module in math can be applied when I calculate the change and the cost of the items sold in our store.) **P13**

The experiences of the pupils in using the Mathematics 6 self-instructional materials are described in the themes such as: difficulty in learning from the self-instructional materials; lack of guidance in learning from the modules; loss of interest in learning/demotivation; and self-fulfillment in learning. It is evident in the result that their difficulty in learning is manifested by instances when they have confusion in understanding the concepts and in doing the learning task required from them; and that some parts of the modules are difficult for them. These observations of the pupils about the modules caused their perceived difficulty. As argued by Graham (2006) [11], with the use of self-instructional materials, learners may be overawed by the learning opportunities that the teachers or learning designers provide.

Furthermore, the lack of guidance in learning from the module is another experience which is also considered as a challenge in modular learning. This means, even if the materials are labelled as self-instruction and is designed for self-learning, it is not a guarantee that the learners are able to learn from it without the need of adult to scaffold in their learning.

The loss of interest in learning is another experience revealed by the pupils which is evidenced by their boredom and with the unanswered parts of the modules. This result implied that there are pupils who are not adapted to modular learning or self-learning. Indeed, as shared by Song and Hill (2007) [12], self-directed learning requires learners to control their own learning since the learning objectives rest on the plans and targets of the learners; hence, this can only succeed if the learners are responsible enough in their own learning.

Interestingly, there are also pupils who revealed their fulfillment in learning the modules. This suggests that while there are those who find modular learning difficult, there are also learners who see the relevance of learning from it as they believed the math topics are helpful in their daily activities. For Khodabandehlou et al. (2012) [13], self-learning is a way to gain skills; it is helping student to learn skills like self-goal setting, management of time and assessing oneself which are all very necessary since these skills are applicable in many circumstances in life.

3.5 Implications for Education Practice

The results of the study have several implications for educational practice. As found out, the modules lack representation and connection features for only some of the modules contain such features. Several literatures have established the necessity of using representations and establishing connections in Math teaching and in learning materials in math since these features can potentially offer various advantages for learners. On this regard, the module developers may check on the modules and may revise its presentations of the topic or learning competencies for learners to find learning easier and more enjoyable.

It was also highlighted in the study that the module is helpful as perceived by the pupil-respondents. Being perceived as helpful does not necessarily mean that the modules offer the necessary help for pupils to learn the concepts. In fact, the results of the interview with the said respondent revealed that they find the difficulty in learning through the modules. This means, there is still a need to review the contents of the modules and modify it for better understanding among the pupils.

The experiences shared by the pupils in learning the module, unfold the most important insight: the learners are struggling to learn and that they need scaffolding. It can be deduced from the responses of the pupils that not all of the topics in the modules are understandable with their own capacity to learn. They need assistance. This means,

the module itself is not fitted to some learners who need teachers and adult to guide in their learning journey. This further implies the need for easy to learn materials which can be determined based on the learning abilities of the learners; the need for immediate assistance when learning difficulty arises; and most importantly, the need to check if the learning tasks are not burdensome for the learners who are not only dealing modules in math but also modules of other subjects by implementing a self-learning plan and schedule.

3.6 Implications for Future Research

One of the limitations of the study is its inability to explore more on the explanation of the results of the quantitative data which reveal that the modules are helpful. It is noticeable the qualitative data on the experiences revealed that pupils find difficulty in learning the modules seem contradictory to their responses that the module is helpful. Future researchers may further investigate on this aspect in qualitative or quantitative method.

Another focus for future research may be to find out other features in the mathematics modules aside from the representation and connection features. Deeper analysis on how these features can be utilized for easier or better mathematics learning among Grade 6 pupils may also be included in the study. However, since the learners expressed their difficulties in learning from their modules, the module developers may develop a new module which is more suitable for the learners particularly those who are under this study.

If time permits, materials being developed for self-learning may be pilot tested for the developers to have better understanding if the material with its content and features, is helpful for the learners or not. This will enable developers of the module to revise the material and make it more helpful for self-directed learning. Moreover, researchers may also assess the impact of the use of modules in mathematics on the academic performance of the learners; and the skills and competencies being acquired or mastered.

4. CONCLUSIONS

The findings of the study pave way to a number of realizations in the researchers' teaching journey amidst the pandemic and that the school authorities may also make this study a springboard or basis for an informed decision making.

As revealed in the study, the contents of the modules do not have enough representations and connection features though these are considered vital in mathematics learning. To mathematics teacher, this served as a wakeup call for checking teaching practices, the learning materials provided to the learners, and the scaffolding initiatives to be taken. Providing printed materials for learning – for pupils to read and to answer is not enough since there is a need to provide them a supplementary material which have been evaluated as to its features and as to its appropriateness for self-learning.

As initially claimed, learning continuity is ensured through the use of modules, and other platforms, the school administrators and the Department of Education may ponder on how these printed materials can have impact to learning. Based on the experiences shared by the pupils, it can be concluded that pupils have varied experiences depending on their abilities and perceptions of their capability to learn. While some claimed to have learned from the module, all of them have common answers- they find some topics/concepts difficult to learn. This may serve as a reminder for mathematics teachers to scaffold the learners who expressed their difficulty in learning. While the pupils in this study perceived the representation and connection features as helpful, they experienced many difficulties in using the module. As earlier presented, there may be parts of the modules to be checked and to be improved to make the representation and connection features more helpful for the learners.

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