Content Validity and Acceptability of a Developed Worktext in Basic Mathematics 2

Asia Pacific Journal of Multidisciplinary Research
Vol. 5 No.1, 72-84
February 2017
P-ISSN 2350-7756
E-ISSN 2350-8442
www.apjmr.com

Mae Joy F. Tan-Espinar[1], Ronato S. Ballado[2]
[1, 2]University of Eastern Philippines, University Town, Catarman, Northern Samar, Philippines
[1]maejoyespinar@yahoo.com, [2]rballado@ymail.com

Date Received: September 28, 2016; Date Revised: December 17, 2016

Abstract *– Teaching tertiary mathematics entails the use of instructional materials which lead to independent learning. The study evaluated the content validity and level of acceptability of a developed worktext in Basic Mathematics 2. It also found the significant difference between the respondents' evaluation. Likewise, the study found the significant difference in the pretest and posttest performance between experimental and the control group and the difference between the posttest of the experimental and control groups. The study utilized the descriptive comparative method in determining the validity and acceptability of the developed worktext and the difference between the evaluation of experts/teachers and the student respondents. Quasi-experimental design was also used to find out if the worktext is effective in teaching the course employing t-test for correlated samples and t-test for independent samples. The result showed that the content validity and acceptability is very much valid and very much acceptable. The difference in the post-test between the experimental and the control groups was significant. It is concluded that the worktext is effective to be used in teaching the course.*

Keywords *– teacher education, content validity, acceptability, developed worktext, Basic Mathematics 2*

INTRODUCTION

Effective mathematics teaching requires understanding of what the students know and need to learn and inspiring and supporting them to learn it well. To be effective, teachers need to understand and be committed to their students as learners of mathematics and as human beings and be skillful in choosing and using a variety of pedagogical strategies and learning materials. Instructional materials provide ideas and practices which frame classroom activity via text and diagrammatic representations and help teachers in achieving goals that they presumably could not or would not accomplish of their own [1].Workbooks/Worktexts are often used in schools and favored because students can work directly in their books [2].

However, the College of Education, University of Eastern Philippines Main Campus mathematics teachers is experiencing difficulty in looking for some textbooks where all the lessons of the course Basic Mathematics 2 could be found. It is deemed important to have textbooks or other learning materials because this will by and large, improve the students' learning performance, which is noted to be below average as indicated in the general average of the COED freshman students of Basic Mathematics 2 of two point fifteen (2.15) in S.Y. 2011-2012, two point two (2.2) in S.Y. 2012-2013, and two point eighteen (2.18) in S.Y. 2013-2014.

In addition, the large number of students with low grades in this subject and the complaint of mathematics teachers about the students' poor mathematical skills are some alarming proofs of the students' mathematical difficulty. One reason perceived by the researcher as well as by other mathematics teachers is the lack of textbooks suited to students' level. Gibbon [3] stressed the need to developed self-instructional materials with the current shift toward individualized programs in all levels of instruction; it is an approach that provides opportunities to develop a coherent instructional program that tolerates and nurture widely divergent goals and accomplishments. The teachers must develop or prepare instructional materials suited to special groups of individuals in her class, whether the instruction is intended for a

whole class, or a student. Smith [4] posits that teachers were encouraged by their immediate superiors to make use of instructional materials in teaching mathematics to make the subject better understood by the students. Furthermore, workbook/worktext provide practice materials and suggestions design to make what would otherwise be trial and error learning definite, fool proof, economical and interesting [5]. Similarly, Gray [6] concluded that the use of workbooks/worktexts is beneficial, resulting in not only higher scores on standardized but also in n increase power of self-direction, helps in retention, skill in fundamental processes, reasoning ability and solving problems.

Bearing in mind the total learning and development of students taking up Basic Mathematics 2, a subject covering basic mathematical skills, particularly in algebra, statistics and probability, and knowing the fact that learning materials are important because they can significantly increase students' achievements, validating and identifying the level of acceptability of a developed worktext in this course is just fitting. This will allow the students to learn the materials in the easier way because the lessons are presented in the language suited to the students' level.

OBJECTIVES OF THE STUDY

The main objective of the study was to validate and find out the level of validity of the worktext in Basic Mathematics 2 in terms of Lesson Objectives, Lesson Inputs, Lesson Application, Lesson Enrichment and the level of acceptability in terms of its clarity, usefulness, suitability, adequacy, timeliness, language, style, and format, illustrations, and presentation. The study determined the significant difference between the evaluation of the teacher and student-respondents. It also determined the significant difference in the pretest performance between the experimental and the control group; find the difference between the pretest and posttest of the experimental group; find the difference in the posttest between the experimental and the control group. Likewise, this study also looked into which area of the worktext needs revision.

METHOD

Based on the syllabus of the course Basic Mathematics 2, the worktext was developed. Various textbooks on Algebra, Statistics and Probability, some existing supplementary materials and internet sources were used in developing the worktext. The worktext was evaluated/validated by 30 professor/mathematics teachers in the University and in the Department of Education, Northern Samar and by 71 freshman students currently enrolled in the course Basic Mathematics 2 second semester of School Year 2014-2015.

The study utilized the descriptive-correlational method in determining the validity and acceptability of the developed worktext and the significant difference between the evaluation of experts/teachers and the student respondents. Quasi-experimental design was also used to find out if the worktext is effective in teaching the course employing t-test for correlated samples and t-test for independent samples.

The respondents were asked to evaluate the worktext using a checklist in terms of its different parts. A checklist which was patterned from the study of Adora [7] was used to evaluate the worktext in terms of its parts namely: Lesson Objectives, Lesson Inputs, Lesson Application, Lesson Enrichment and in terms of its clarity, usefulness, suitability, adequacy, timeliness, language, style, and format, illustrations, and its presentation.

To further test if the worktext is acceptable and effective, an experimental method was utilized between two intact classes of Basic Mathematics 2. Thirty six students taking up Bachelor of Elementary Education Home Economics served as the experimental group, the group who was exposed to the worktext. The other thirty five students enrolled in the Bachelor of Science in Home Economics program served as the control group, the group who was subjected to traditional lecture instruction. Since the groups are intact, the students were not chosen randomly for each group. These two sections were chosen based on their Math 101 (Basic Mathematics 1) grades to ensure comparability of the groups. The grades in the pre-requisite subject of the two groups were compared using t-test for independent means. The difference was found to be non-significant at .05 level. Hence, the two groups were comparable. A pretest was conducted first between the two groups before they undergone through the experimentation process.The experimental group were exposed to

the worktext and taught with the use of it for three chapters or 16 different lessons. While the control group, were taught without exposing from the worktext. After the 16 lessons, both groups took a posttest with the same test items.

To test the differences, t-test for correlated samples, t-test for uncorrelated samples, and t-test for independent sample were used. To interpret the level of validity of the worktext, the following scale was used: 4.20 – 5.00: Very Much Valid (VMV); 3.40 – 4.19: Much Valid (MV); 2.60 – 3.39: Valid (V); 1.80 – 2.59: Less Valid (LsV); 1.00 – 1.79: Least Valid (LeV).

To interpret the level of acceptability of the worktext, the following scale was used: 4.20 – 5.00: Very Much Acceptable (VMA); 3.40 – 4.19: Much Acceptable (MA); 2.60 – 3.39: Acceptable (A); 1.80 – 2.59: Less Acceptable (LsA); 1.00 – 1.79: Least Acceptable (LeA).

RESULT AND DISCUSSION

Table 1. Respondent's Evaluation on the Validity of the Worktext's Lesson Objectives

Lesson Objectives	Mean		Total	VI
	Teachers	Students		
1. The lesson objectives of the worktext are….				
1.1 relevant to the objectives/ topics of Basic Mathematics 2 (Math 102)	4.90	4.68	4.85	VMV
1.2 specific and clearly stated	5.00	4.64	4.82	VMV
1.3 measurable	5.00	4.36	4.68	VMV
1.4 attainable	5.00	4.63	4.82	VMV
1.5 result oriented	4.70	4.64	4.67	VMV
1.6 time bound	4.60	4.4	4.5	VMV
Section Mean	**4.87**	**4.56**	**4.72**	**VMV**

Table 1 presents the evaluation of the worktext's content validity with respect to its lesson objectives. Both teachers and students evaluated the worktext's Lesson Objectives "very much valid" with evaluation means of 4.87 and 4.56, respectively and a section mean of 4.72. This indicated that a majority of the respondents assessed this section to be very much valid. It can be seen on the table that the teachers' ratings were higher than the students' evaluation. This means that the teachers are more knowledgeable in the scope and coverage of the course and in identifying if the objectives are stated in SMART (Specific, measurable, attainable, result oriented, and time bound) way. In like manner, the teachers know better if the stated objectives are relevant to the course.

Table 2. Respondent's Evaluation on the Validity of the Worktext's Lesson Inputs

Lesson Inputs	Mean		Mean	VI
	Teachers	Students		
The lesson inputs of the worktext				
2.1 give insights and ideas of what the activity is all about	4.60	4.83	4.72	VMV
2.2 provide background of concepts and information about the topic	4.37	4.50	4.4	VMV
2.3 attract students' attention	4.30	4.50	4.4	VMV
2.4 arouse students' interest	4.30	4.67	4.49	VMV
Section Mean	**4.39**	**4.63**	**4.51**	**VMV**

With respect to the lesson inputs, the teacher and student respondents evaluated the worktext "very much valid" with evaluation means of 4.39 and 4.63, respectively and a section mean of 4.51. It shows in table 2 that the respondents' evaluation in almost all statements had very small differences. Both found the worktext interesting and could arouse students' attention. However the respondents' evaluation on almost all the items revealed higher than the teachers did. This points out that for the students the lesson inputs had enough information, while the teacher found it insufficient. This implies that there is a need to augment the lessons presented in the developed worktext. This is supported by their suggestions to provide additional information, additional examples, and to provide background information about the topic.

Table 3 presents the respondent's evaluation on the validity of the worktext's lesson application. The lesson application was rated by teachers and

students as "very much valid" with means of 4.55 and 4.65, respectively and a section mean of 4.60.

Table 3 Respondent's Evaluation on the Validity of the Worktext's Lesson Application

Lesson Application	Mean		Average	VI
	Teachers	Students		
The lesson application of the worktext is….				
3.1 in consonance with the course objectives	4.83	4.54	4.69	VMV
3.2 relevant to the Lesson Objective/s	4.83	4.79	4.81	VMV
3.3 properly sequenced	4.60	4.50	4.55	VMV
3.4 can be accomplished according to schedule	4.27	4.42	4.35	VMV
3.5 interesting	4.50	4.87	4.69	VMV
3.6 adequate to develop students'' mathematical knowledge and skills	4.53	4.79	4.66	VMV
3.7 appropriate to students' abilities	4.47	4.65	4.56	VMV
3.8 sufficient enough to determine the mastery level of students	4.33	4.63	4.48	VMV
Section Mean	**4.55**	**4.65**	**4.60**	**VMV**

Though the respondents strongly agreed to these items, it could be noted that among other criteria, the means showed the highest difference in the item "the worktext is interesting". The students had a higher mean compared to the teachers which denotes that for the students the lesson application or the different exercises are interesting. In contrary, the teachers showed the lower mean because for them this part needs to be improved as shown in their suggestions that this should include chapter test/achievement test, and additional exercises.

Table 4. Respondent's Evaluation on the Validity of the Worktext's Lesson Enrichment

Criteria	Mean		Mean	VI
	Teachers	Students		
Lesson Enrichment The lesson enrichment of the worktext …….				
4.1 is adapted to the students' level of comprehension	4.73	4.60	4.67	VMV
4.2 is challenging	4.70	4.92	4.81	VMV
4.3 is well-constructed	4.67	4.80	4.74	VMV
4.4 stimulates higher order thinking skills	4.67	4.76	4.72	VMV
4.5 is adequate and enough to determine students' mastery level	4.43	4.52	4.48	VMV
4.6measures what has been learned	4.63	4.56	4.60	VMV
4.7 enhances mathematical understanding and skills	4.80	4.92	4.86	VMV
4.8 facilitates developing high level mathematical problem solving and thinking skills	4.77	4.76	4.77	VMV
Section Mean	**4.68**	**4.73**	**4.71**	**VMV**

Table 4 presents the respondent's evaluation on the validity of the worktext's lesson enrichment. As for the assessment on lesson enrichment, the teachers and students rated the section "very much valid" with evaluation means of 4.68 and 4.73 respectively, and a section mean of 4.71. This means that the evaluators rated the worktext's lesson enrichment very much valid. Both groups of respondents strongly agreed that the lesson enrichment facilitates high level mathematical thinking skills and is challenging. It could be seen on the table that though this section was evaluated in general as very much valid, there was a little difference in the evaluation of the respondents. One striking statement in this section is "the lesson enrichment enhancesmathematical understanding and skills" which showed the highest average evaluations of respondents. This is an indication that both the teachers and students found the

presented activities in the lesson enrichment helpful in enhancing mathematical understanding and skills.

Table 5. Summary Result of the Evaluation on the Worktext's Validity

Part of the Worktext	Mean		Mean	VI
	Teachers	Students		
Lesson Objectives	4.87	4.56	4.72	VMV
Lesson Inputs	4.39	4.63	4.51	VMV
Lesson Application	4.55	4.65	4.60	VMV
Lesson Enrichment	4.68	4.73	4.71	VMV
Grand Mean	**4.62**	**4.64**	**4.64**	**VMV**

Table 5 presents the summary result of the evaluation on the worktext's validity. As far as the validity of the worktext is concerned, the teachers and students registered a grand mean evaluation of 4.62 and 4.64 with an overall grand mean of 4.64, which means that the content validity as a whole is "very much valid". This indicates that the respondents strongly agreed that its different parts as to the lesson objectives; lesson inputs, lesson application, and lesson enrichment are useful, appropriate and very much related to the different topics included in the course Basic Mathematics 2. This further indicates that the validity measures done by the evaluators determine the students' knowledge, skills, and other attributes. This conforms to the findings of Gayagay [8] on validating a learning package for Grade seven Mathematics.

The lesson objectives section revealed the highest average of 4.72, which is an indicator that this is the strongest point among the four parts of the worktext. This is supported by the comments of the respondents to wit: objectives clearly coincides its respective lesson inputs; the objectives are stated following the SMART principle; reflects the application; authentic and suitable. In contrary, the lesson inputs section has the lowest mean of 4.51 among the different parts of the worktext, although this still falls on the "very much valid" category, there is a need to improve this part of the worktext.

Evaluation on the Level of Acceptability of the Developed Worktext

The worktexts' level of acceptability was determined by the teacher and student respondents evaluating the different aspects as to clarity, usefulness, suitability, adequacy, timeliness, language, style, format, illustrations, and presentation. The result of evaluation is hereby presented.

Table 6. Respondents' Evaluation on the Level of Acceptability of the Developed Worktext in Terms of its Clarity

Criteria	Mean		Mean	VI
	Teachers	Students		
The worktext's…..				
1.1 information is clear and simple	4.77	4.8	4.79	VMA
1.2 language used is clear and easy to understand	4.80	4.79	4.80	VMA
1.3 concepts for each activity are arranged logically	4.67	4.44	4.56	VMA
1.4 information suit the students' level of comprehension	4.70	4.44	4.57	VMA
Section Mean	**4.74**	**4.62**	**4.68**	**VMA**

Table 6 provides the evaluation of the teachers and the students on the level of acceptability with respect to clarity. It indicated the teachers' mean evaluation of 4.74 and the students mean evaluation of 4.62 with a section mean of 4.68, interpreted as "very much acceptable". The table reflects that the teachers had a higher mean evaluation than the students. Among the different criteria of evaluating the worktext's clarity, the statement "language used in the worktext is clear and easy to understand" has the highest mean difference between the two groups of respondents. This indicates that the teachers find it to be clear and simple because they know better the contents of the course and for them the worktext is suited to the level of its users. On the other hand, the statement" the worktext's concepts are arranged logically" got the lowest mean difference between the evaluations of the respondents. It is clear that both teachers and students find the different activities to be logically arranged.

Table 7 presents the respondents' evaluation on the level of acceptability of the developed worktext in terms of its usefulness.

Table 7 Respondents' Evaluation on the Level of Acceptability of the Developed Worktext in Terms of its Usefulness

Usefulness	Mean		Mean	VI
	Teachers	Students		
The worktext……				
2.1 prepares the students to think logically and critically	4.63	4.72	4.63	VMA
2.2 is simple and comprehensible	4.73	4.56	4.68	VMA
2.3 has contents that increase the students' knowledge, understanding, and proficiency/skills	4.63	4.76	4.61	VMA
2.4 provides opportunity for the development/ enhancement of mathematical skills	4.77	4.92	4.76	VMA
2.5 has learning contents that provide adequate information on the topics presented	4.57	4.68	4.60	VMA
2.6 encourages the students to become actively involved in the learning activities	4.43	4.56	4.43	VMA
2.7 stimulates the learners' analytical thinking skills	4.70	4.64	4.64	VMA
2.8 presents activities that seek to relate new concepts from previous	4.43	4.68	4.46	VMA
Section Mean	**4.61**	**4.69**	**4.65**	**VMA**

The usefulness of the worktext was evaluated by teachers and students with means of 4.61 and 4.69, respectively with a section mean of 4.65. This indicates that the worktext was evaluated to be "very much acceptable". As shown in table 7, the students reflected a higher mean evaluation than the teachers mean evaluation. Among the eight criteria, the statement "the worktext presents activities that seek to relate new concepts from previous" displayed a highest mean difference between the evaluations of the respondents. This means that the students highly agreed than the teachers that the worktext presents activities that relate the new concepts with the previous one, but still the teachers rated this criterion as very much accepted. The rest of the criteria exhibited an almost the same mean evaluations. This indicates that both respondents agreed on the worktext's usefulness to be acceptable.

Table 8 Respondents' Evaluation on the Level of Acceptability of the Developed Worktext in Terms of its Suitability

Suitability	Mean		Mean	VI
	Teachers	Students		
The worktext's				
3.1 activities take into consideration the varying attitudes and capabilities of the learner	4.37	4.70	4.54	VMA
3.2 activities are suitable to the topic	4.70	4.88	4.79	VMA
3.3 activities are relevant, interesting, and self-motivating	4.57	4.80	4.69	VMA
3.4 enrichment activities are adaptable to classes with large number of students	4.37	4.68	4.53	
Section Mean	**4.50**	**4.77**	**4.64**	**VMA**

Table 8 presents the respondents' evaluation on the level of acceptability of the developed worktext in terms of its suitability. Considering the suitability of the developed worktext, the teachers and students rated it "very much acceptable" with evaluation means of 4.50 and 4.77, respectively and a section mean of 4.64. It could be observed on

table 8 that the students rated this criterion higher than the teachers rating.

Out of the four (4) statements of this criterion, the one that shows the biggest mean difference in the mean evaluations of respondents is on the statement "the worktext's activities take into consideration the varying attitudes and capabilities of the learners". This is an indication that the students find the worktext's activities with a provision of individual capabilities than the teachers did.

Table 9. Respondents' Evaluation on the Level of Acceptability of the Developed Worktext in Terms of its Adequacy

Adequacy	Mean		Mean	VI
	Teachers	Students		
The worktext…..	4.77	4.70	4.74	
4.1 covers all topics in the course syllabus	4.40	4.70	4.55	VMA
4.2 provides sufficient information on each topic	4.60	4.68	4.64	VMA
4.3 provides expected learning	4.23	4.50	4.37	VMA
4.4 contains a variety of situation strategies	4.37	4.60	4.49	VMA
4.5 defines important terms for reinforcement	4.47	4.80	4.64	VMA
4.6 provides enough activities to increase students' knowledge, skills, and attitudes	4.53	4.80	4.67	VMA
4.7 explains and applies concepts and principles				
Section Mean	**4.48**	**4.68**	**4.58**	**VMA**

Table 9 presents the respondents' evaluation on the level of acceptability of the developed worktext in terms of its adequacy. The teachers and students evaluated this section "very much acceptable" with evaluation means of 4.48 and 4.68 respectively, a section mean of 4.58. Generally, both teachers and students strongly agreed that the worktext covers all topics in the course syllabus and met the criteria set as indicated in their ratings. Among the seven (7) criteria set, the most striking statement is "the worktext provides enough activities to increase students' knowledge, skills, and attitudes" which noted to have the highest mean difference between the respondents' evaluations. This signifies that though the teachers rated this as very much acceptable, they still found the worktext to be lacking as supported by their suggestions that items like games, puzzle and mind bogglers be included. In contrary, the students find this area as sufficient and adequate as indicated in their mean evaluation which is higher than the teachers' mean evaluation.

Table 10 Respondents' Evaluation on the Level of Acceptability of the Developed Worktext in Terms of its Timeliness

Criteria	Mean		Average	Interpret
	Teachers	Students		
Timeliness				
The validation and use of the worktext is timely because….				
5.1 it is one of the tools for quality learning	4.83	4.79	4.81	Very Much Acceptable
5.2 teachers are encouraged to produce workbook/ worktext to make teaching – learning effective	4.83	4.79	4.81	Very Much Acceptable
5.3 students need instructional materials where they could apply what had been discussed in the classroom	4.87	4.71	4.79	Very Much Acceptable
Section Mean	**4.84**	**4.76**	**4.80**	**Very Much Acceptable**

P-ISSN 2350-7756 | E-ISSN 2350-8442 | www.apjmr.com
Asia Pacific Journal of Multidisciplinary Research, Vol. 5, No. 1, February 2017

Table 10 presents the respondents' evaluation on the level of acceptability of the developed worktext in terms of its timeliness. In view of the timeliness criterion, the teachers and students rated it "very much acceptable" with evaluation means of 4.84 and 4.76 respectively, with a section mean of 4.80. This clearly indicates that the respondents strongly agreed that the development, validation and use of the worktext are timely. The specific statement that shows the highest mean difference is "students need instructional materials where they could apply what had been discussed in the classroom where the teachers rated this 4.87 while the students evaluated this with 4.71 only.

One of the comments in an informal interview with the students revealed that even if students are in favor of the teachers' development of worktext/workbook, they find it expensive and an additional financial burden. This is a clear indication that though teachers are encouraged in developing worktext/workbook for the smooth delivery of the lessons/topics, it will be costly on the part of the students. But on the other hand, they also agreed that this worktext is very much helpful in their learning and they need instructional materials where they could apply what they had been learning, and an answer to the problem of unavailability of textbook/worktext in Basic Mathematics 2.

Table 11 presents the respondents' evaluation on the level of acceptability of the developed worktext in terms of its language, style and format. The language, style, and format evaluated by teachers and students as "very much acceptable" with evaluation means of 4.45 and 4.67 respectively and a section mean of 4. 56. Though this rating warrants that the developed worktext met the criteria, the highest mean difference between the respondents' evaluations lies on the statement "the format and style of the worktext warrants proper spacing of items". The teachers rated it with a mean of 4.27 which is a little lower than the students mean of 4.71. This signifies that the teachers still want to modify and to revise this area, as sustained by their suggestions to improve the font size/style, to check the spacing on pages 48 and 115, and to check/improve symbols and formats.

Table 11. Respondents' Evaluation on the Level of Acceptability of the Developed Worktext in Terms of its Language, Style and Format

Language, Style, and Format	Mean		Mean	VI
	Teachers	Students		
The format and style of the worktext warrants…				
6.1 appropriate use of illustrations	4.33	4.67	4.50	VMA
6.2 proper spacing of items	4.27	4.71	4.49	VMA
6.3 use of optimum print size	4.47	4.80	4.64	VMA
6.4 variation in the positioning of response sections	4.33	4.42	4.38	VMA
6.5 the observation of correct grammar	4.63	4.71	4.67	VMA
6.6 clear and comprehensive language in terms of vocabulary	4.60	4.71	4.66	VMA
6.7 sufficient familiar vocabulary to ensure learning	4.53	4.71	4.62	VMA
6.8 appropriate structure, style and format to the target level	4.47	4.63	4.55	VMA
Section Mean	**4.45**	**4.67**	**4.56**	**VMA**

The illustration revealed teachers' mean evaluation of 4.50, students' mean evaluation of 4.72, and a section mean of 4.61 is interpreted as "very much acceptable". Table 12 showed that the students rated almost all the items higher than the teachers did. It is in the statement "the illustrations used provide visual concrete clues" that showed the highest mean difference which is supported by their suggestions to provide more illustrations to visualize mathematical concepts especially to the topic probability.

Table 12. Respondents' Evaluation on the Level of Acceptability of the Developed Worktext in Terms of its Illustrations

Illustrations	Mean		Average	VI
	Teachers	Students		
The illustrations used…				
7.1 are clear and simple	4.60	4.80	4.70	VMA
7.2 arouse students' interest, making learning effective and enjoyable	4.43	4.63	4.53	VMA
7.3 provide concrete visual clues	4.20	4.63	4.42	VMA
7.4 guide students to follow directions	4.53	4.79	4.66	VMA
7.5 relevant to the topic	4.73	4.73	4.73	VMA
Section Mean	**4.50**	**4.72**	**4.61**	**VMA**

Table 13. Respondents' Evaluation on the Level of Acceptability of the Developed Worktext in Terms of its Presentation

Presentation	Mean		Average	Interpret
	Teachers	Students		
The presentation of..				
8.1 topics is logical and orderly sequenced	4.67	4.79	4.73	VMA
8.2 directions are concise, readable, and easy to follow	4.63	4.79	4.71	VMA
8.3 topics fit the sequence of the course	4.73	4.67	4.70	VMA
Section Mean	**4.68**	**4.75**	**4.72**	**VMA**

Table 13 presents the respondents' evaluation on the level of acceptability of the developed worktext in terms of its presentation. As to the presentation, it showed that the teachers mean evaluation is 4.68, the students mean evaluation is 4.75 and a section mean of 4.72. Both respondents agreed that the presentation of the worktext is "very much acceptable". It is clear that the respondents appreciated and agreed on the proper presentations of the different topics of the worktext, though there are parts to be revised as indicated in the suggestion to improve some directions/instructions in the lesson inputs and lesson application.

Table 14 shows the summary result of the worktext's level of acceptability. The teachers and students rated this with grand means of 4.62 and 4.71, respectively and an overall grand mean of 4.67. This indicates that both groups of respondents strongly agreed that the worktext met the criteria set and therefore rated as "very much acceptable". This finding supports the studies of Gayagay [8] and Menor & Limjap [9].

Table 14. Summary Result of the Evaluation on the Worktext's Level of Acceptability

Criteria	Mean		Average	VI
	Teachers	Students		
Clarity	4.74	4.62	4.68	VMA
Usefulness	4.61	4.69	4.65	VMA
Suitability	4.50	4.77	4.64	VMA
Adequacy	4.48	4.68	4.58	VMA
Timeliness	4.84	4.76	4.80	VMA
Language,	4.45	4.67	4.56	VMA
Style, Format	4.50	4.72	4.61	VMA
Illustrations				
Presentations	4.86	4.75	4.72	VMA
Grand Mean	**4.62**	**4.71**	**4.67**	**VMA**

The table reflects that among the eight criteria, "Language, Style and Format" got the lowest section mean of 4.56. This is supported by the respondents' suggestions to provide exercises where varied situation strategies could be employed and to improve the worktext's font size/style, and to check the spacing on some texts. As shown also in the table, the section "timeliness" got the highest section mean of 4.80. This indicates that the development of the worktext is timely and appropriate to be used in the course Basic Mathematics 2. As a whole, it was shown that the worktext is ready to be used as evaluated by the respondents, though minor modifications were suggested to further improve the material.

Table 15 presents the difference between the evaluation of teachers and students on the content validity of the worktext. The mean of the teacher respondents was 4.6255 while the student respondents had a mean of 4.6425.

Table 15. Teachers and Students Evaluation Mean Difference on the Worktext's Validity

INDEPENDENT SAMPLES t-TEST

	Teacher	*Students*
Mean	4.6225	4.6425
Variance	0.041291667	0.004891667
Observations	4	4
Hypothesized Mean Difference	0	
Df	4	
t Stat	-0.186130	
P(T<=t) one-tail	0.4307003	
t Critical one-tail	2.1318467	
P(T<=t) two-tail	0.8614006	
t Critical two-tail	2.7764451	

Note: *Not Significant*

It is indicated that the t-computed value of -0.1861 was less than the critical value of 2.7764. Hence, there is no significant difference between the evaluations of the two groups on the worktext's validity.

Table 16. Teachers and Students Evaluation Mean Difference on the Worktext's Level of Acceptability

INDEPENDENT SAMPLES t-TEST

	Teacher	*Students*
Mean	4.6225	4.7075
Variance	0.02825	0.002678571
Observations	8	8
Hypothesized Mean Difference	0	
Df	8	
t Stat	-1.367048708	
P(T<=t) one-tail	0.104392828	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.208785656	
t Critical two-tail	2.306004135	

NOTE: *Not Significant*

Table 16 presents the difference between the evaluation of teachers and students on the worktext's level of acceptability. The mean of the teacher respondents was 4.6225 while the student respondents had a mean of 4.7075. It is indicated that the t-computed value of -1.3670 was less than the critical value of 2.3060. Hence, there is no significant difference between the evaluations of the two groups on the worktext's level of acceptability.

Table 17. Comparison of the Pretest Performance of Experimental and Control Group

INDEPENDENT SAMPLES t-Test:

	Pretest Scores	
	Experimental	*Control*
Mean	10.69444444	10.05714286
Variance	3.018253968	2.290756303
Observations	36	35
Hypothesized Mean Difference	0	
Df	68	
t Stat	1.649410728	
P(T<=t) one-tail	0.051838002	
t Critical one-tail	1.667572281	
P(T<=t) two-tail	0.103676005	
t Critical two-tail	1.995468931	

Note: Not Significant

As shown in Table 17,the difference of the pretest performance of the experimental and control group was found to be insignificant at 0.05 level of significance, because the obtained t-computed value which was 1.649 was less than the critical value of 1.995. This means that the two groups of respondents were almost in the same level of abilities at the start of the experimental. Hence, they showed comparable results of pretest.

Table 18. Comparison of the Pretest and Posttest Performance of Experimental Group

Paired Sample t-Test:
EXPERIMENTAL SCORES

	Pre-test	*Post-test*
Mean	10.69444444	37.58333333
Variance	3.018253968	9.45
Observations	36	36
Pearson Correlation	-0.040569374	
Hypothesized Mean Difference	0	
Df	35	
t Stat	-44.9161511	
P(T<=t) one-tail	7.68576E-33	
t Critical one-tail	1.689572458	
P(T<=t) two-tail	1.53715E-32	
t Critical two-tail	2.030107928	

Note: ***Significant***

It can be viewed from Table 18 that the performance of the experimental group has improved as evidence of their pretest and posttest mean scores of 10.69 to 37. Moreover, when the

mean difference between their pretest and posttest mean scores was subjected to t-test, it was found out to be significant at 0.05 level, because the obtained t-computed value which was -44.916 is beyond the critical value of 2.03. Hence, the experimental group performed better in the posttest than in their pretest. Based on the results of the comparison of the pretest and posttest of the experimental group, it can be said that the worktext is a valid instructional material. This result supports the findings of Pedrera [10], Belecina [11], Reyes [12], and Coz [13].

Table 19 shows the difference of the posttest scores of the experimental and control group. To determine the effectiveness of the instruction using worktext as compared to the usual lecture-discussion method of teaching Basic Mathematics 2, the posttest results of both groups were treated statistically using the t-test for uncorrelated means.

Table 19. Posttest Performance of Experimental and Control Group

Independent Samples t-Test: Posttest Results		
	Experimental	*Control*
Mean	37.58333333	20.37142857
Variance	9.45	8.122689076
Observations	36	35
Hypothesized Mean Difference	0	
Df	69	
t Stat	24.47439983	
P(T<=t) one-tail	4.88062E-36	
t Critical one-tail	1.667238549	
P(T<=t) two-tail	9.76124E-36	
t Critical two-tail	1.994945415	

Note: ***Significant***

It is evident from the table that the posttest mean scores in the experimental group are significantly higher than the posttest mean scores of the control group at 0.05 level of significance, the obtained t-computed value which was 24.474 was beyond the critical value of 1.994. This implies that the experimental group performed significantly better than the control group. This further implies that the worktext effectively taught the lessons of the subject better than the usual lecture instruction. The result of the study conforms to the study of Pedrera [10] and Ali [14] which concluded that using modular method in teaching Elementary Algebra and Biology, respectively, is more effective compared to traditional teaching method.

Comments Suggested for the Revision of the Worktext

While both content validity and acceptability were rated very high by both teachers and students, there were specific comments and suggestions on the different aspects of the worktext from the teacher and student respondents. Comments and suggestions on the revisions of the different parts were provided in the open-ended part of the evaluation questionnaire. For lesson objectives, suggestions for improvement focused on providing time allotment to every lesson. This is the only suggestion of the respondents in this area. The time allotment will be a guide on how long the students will work on a certain lesson.

As to the Lesson inputs, revisions are suggested on the provision of more illustrations to visualize mathematical concepts with the highest frequency; additional real life examples with the second highest frequency; a detailed explanation on the process be shown the third in rank; and more background information, adequate explanation of terms used, and improving the font size/style. These are the focus of the revisions under the lesson inputs.

For the lesson application, the provision of an achievement test/chapter test and improvement of spacing of items were the most suggested. Other suggestions were the improvement of directions or instructions and the provision of more exercises.

As to the lesson enrichment, revisions of the worktext include provisions of games, puzzle and mind bloggers and trivia. Online resources/ mathematics websites were also suggested to provide additional resources to the worktext.

CONCLUSIONS

Based on the result of this study, the two groups of respondents agreed that the developed worktext possesses content validity and it is in line with the course syllabus of Basic Mathematics 2; the lesson objectives is content valid and the objectives followed the principle of SMART and relevant to the course topics of Basic Mathematics 2; the lesson inputs section has content validity and the lessons presented clearly the key concepts and the background information needed to understand

the lesson; similarly, the lesson application of the worktext possesses content validity. The activities and exercises in this section are relevant and in consonance with the course syllabus. All activities are adequate, sufficient and appropriate to its intended users. The lesson enrichment section also holds content validity. This part of the worktext is challenging and enhances the mathematical skills of the students.

The worktext is accepted by both the teachers and the students. This could be used as a tool in enhancing the teaching-learning processes in Basic Mathematics 2. The lessons, activities, exercises, and information presented are clear, simple and easy to understand. Likewise, the lessons in the worktext provide adequate information and stimulate the learners' analytical thinking skills. The activities are relevant, interesting, self-motivating, and are adaptable to classes with large number of students. It covers all topics in the course syllabus of Basic Mathematics 2 and presents adequate and sufficient activities and information. The development of worktext was timely and both respondents were in favor of its development and validation. In general, it provides appropriate language, structure, style, and format and warrants clear and comprehensive language. The illustrations used are clear, simple, and relevant to the topic. It arouses the students' interest. The topics are logically and orderly sequenced according to the course.

The respondents are in agreement that the developed worktext meets the criteria in designing an instructional material. This could be used as a tool in enhancing teaching-learning process. The quasi-experimental procedure also showed that the use of worktext in teaching Basic Mathematics 2 enhances students' achievement. Comments for improvement on content validity focused on time allotment for lesson objectives; explanations, illustrations, and examples for lesson inputs; test and instructions for lesson application; trivia and online resources for lesson enrichment. Comments for the level of acceptability focused on clarity of instructions, spelling and definition of terms, additional illustrations, editing and detailed discussions. There were no comments for revisions on usefulness, suitability, and timeliness.

RECOMMENDATION

The worktext should be considered as an instructional material and be used in the teaching-learning process of the course. The worktext should be tried out in other school to further improve its effectiveness and practicability. Teachers/professors should be motivated to make their own worktext/module/ instructional materials. The school administration should provide support in the production of this worktext and other instructional materials produced by faculty members.

Since the worktext was subjected for validation only in the UEP College of Education, the findings of the study are conclusive only for the University. Hence, further study on a wider scope should be conducted.

REFERENCES

[1] Brown, M.W (2009). The Teacher-tool Relationship: Theorizing the Design and Use of Curriculum Materials. New York: Routledge

[2] Anderson K. (2003). Getting What You Want: Developing a Workbook. New York, USA: Dutton Publishing, Inc

[3] Gibbon, M. Individualized Instruction. (2004). New York: Teacher's Columbia University Press

[4] Smith, J. 2007. "Introduction Service for Math Teaching."The Modern Teacher, 30

[5] Gates, A. (2005). "An Analysis of Certain Purposes and Merits of Workbooks Materials*."*Curriculum Journal, 6

[6] Gray, W.S. (2007). " The Teaching of Reading." Thirty-Sixth Yearbook: Part I. A Second Report of the National Society for the Study of Education. Bloomington: Public School Publishing Company

[7] Adora, N. (2013). "Mathematics Performance of Grade Six Pupils in the National Achievement Test, Division of Northern Samar as Basis in Developing A workbook in Elementary Mathematics VI." Unpublished Dissertation, University of Eastern Philippines

[8] Gayagay, G. (2014). "Development and Validation of a Learning Package for Grade Seven Mathematics" Conference Proceedings, International Research Conference on Higher Education, Bacolod City

[9] Menor, N. & Limjap A. (2011). "Evaluation of the Design and Implementation of a Learning Package on Ratio and Proportion Using the

Understanding by Design Framework". Conference Proceedings, International Conference on Mathematics Education, Olongapo City.

[10] Pedrera, T.A. (2011)."Modular Teaching in Elementary Algebra." Unpublished Dissertation, University of Eastern Philippines

[11] Belecina, R.C. (1999)."The Development and Validation of Self Instructional Materials in College Statistics" SIYASIK, PNU Research Journal Vol. 6, number 1, November 1999. ISSN 0119-5093

[12] Reyes, L.L. (1984). "Deficiencies in Math I of the First Year High School Students of the Four Agriculture Schools in the Division of Cagayan: Modularization of the Three Most Serious Deficiencies: Unpublished Master's Thesis, Marikina Institute of Science and Technology

[13] Coz, T. (2005). "Proposed Supplementary Learning Materials Using Cooperative Industrial Approach in Mathematics for Grade VI: Its Acceptability" Unpublished Dissertation, Eulogio Amang Rodriquez Institute of Science and Technology

[14] Ali, R. (2005). "Development and Effectiveness of Modular Teaching in Biology at Secondary Level", University Institute of Education and Research, University of Amid Agriculture, Rawalpindi, Pakistan