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Interactive Ilokano Mother Tongue-Based Courseware for Grade 1 Mathematics: Development and Usability

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ABSTRACT

Tablets, Smartphones, and Phablet, attract so much the attention of pupils because of the things that they can do with these gadgets. The study developed a mother tongue-based courseware for Grade 1 Mathematics and undergone usability testing at the Abra State Institute of Sciences and Technology, Lagangilang, Abra, Philippines. It employed the descriptive and applied methods of research. Documentary analysis was used to identify the topics covered in Grade 1 mathematics. The ADDIE model was used to develop the courseware. Finally, a questionnaire that was designed to evaluate multimedia systems was adopted. The study found out that the topics covered in Grade 1 Mathematics of the ASIST-LS were divided into Quarters 1 and 2, and Quarters 3 and 4. Quarters 1 and 2 consist of *Maysa Inggana Sangapulo*, *Sangapulo ket Maysa Inggana Duapulo*, *Duapulo ket Maysa Ingana Limapulo*, *Limapulo Inggana Sangagasut*, Skip Counting by Twos, and Skip Counting by Tens. Quarters 3 and 4 consist of Addition, Shape, Using the Calendar, and Comparison of Things. The developed courseware provides pupils ability to repeat the topics and activities that lead them to master the lesson at their own pace. The usability survey result revealed that courseware was usable.

Keywords — Mother tongue, Courseware, Grade 1 Mathematics, e-learning, descriptive-applied design, Philippines

INTRODUCTION

Tablets, Smartphones, and Phablets attract so much the attention of pupils because of the things that they can do with these gadgets like sending emails, browsing the web, viewing video games, and reading electronic books or e-books that are enriched with images, videos, or interactive elements.

In Thailand, based on a University survey, 97.4% believed that mobile learning (mLearning) would enhance their present learning capabilities (Vate-U-Lan, 2008). Also, in Malaysia, to take advantage of the advances in mobile devices technologies, Mahamad, Ibrahim and Taib (2010) claimed that mlearning could help the primary school students learn mathematics.

Mathematics is a vital part of the intellectual equipment of every person. Mathematics achievement is important in its own right, and is increasingly recognized as crucial to the nation's economy (Brainerd & Reyna, 2007). It is one of the mandatory subjects for Grade 1.

The method of teacher in delivering the Grade 1 Mathematics is conventional. The teacher uses blackboard and chalk to present and discuss lessons in class. On the other hand, based on the survey, the learning styles of the Grade1 pupils of ASIST-LS in studying Mathematics are: 1) 40% of the pupils favors audio-video manner which is interpreted as a major learning style, 35% kinesthetic, and 25% auditory learning. This means that the Grade 1 pupils prefer studying Mathematics using audio-video mode because they learn well when they watch videos and hear sounds. Matching students' learning styles is effective in enhancing the students' learning gains (Ziri, 2009).

Teaching mathematics is a great challenge, but it is more challenging when the language used to teach math is foreign to the learners. Multimedia learning courseware has the potential in facilitating learners to acquire the knowledge and skills. To take advantage of the said potential, the study intends to develop a mother tongue-based courseware for Grade 1 Mathematics that runs on Tablets, Smartphones, and Phablets and match the learning style of the pupils. Furthermore, the study sought to simplify how pupils can understand mathematics better using multimedia to be presented in mother tongue (Hurmuzan & Yahaya, 2015).

The study differs with Interactive courseware for Grade 1 Mathematics developed by National Institute of Science and Mathematics Educational Development (NISMED) in terms of lessons included in the courseware, activities, fixing skills, evaluation and most importantly, the language used since it utilized Ilokano mother tongue in consonance with the Department of Education (DepEd) order number 16, series of 2012 that requires the implementation of

the Mother Tongue-Based- Multilingual Education (MTB-MLE) starting School Year (SY) 2012-2013 in all public schools, specifically, in Kindergarten, Grades 1, 2 and 3 as part of the K to 12 Basic Education Program.

OBJECTIVE OF THE STUDY

The main objective of the study was to develop a courseware for Grade 1 Mathematics at the Abra State Institute of Sciences and Technology Laboratory School (ASIST- LS), Philippines. Specifically, it aimed to identify the: 1) Topics covered in Grade 1 Mathematics at the ASIST Laboratory School; 2) Develop a courseware for Grade 1 Mathematics at the Abra State Institute of Sciences and Technology Laboratory School (ASIST-LS); 3) Determine the usability of the developed Courseware for Grade 1 Mathematics at the Abra State Institute of Sciences and Technology Laboratory School (ASIST-LS) in terms of visibility, completeness, memorability, navigation, consistency, simplicity aesthetic, satisfaction, availability, feedback, and educational learning.

METHODOLOGY

Research Design

The researchers used both descriptive and applied methods of research in the study. Descriptive research was used to narrate how the courseware was developed. The study applied ADDIE model to produce the Interactive Ilokano Mother Tongue-Based Courseware for Grade 1 Mathematics**.**

The paradigm in Figure 1 shows the interaction of the Input-Process-Output (IPO) variables that were used in the development of a Courseware for Grade 1 Mathematics at the Abra State Institute of Sciences and Technology Laboratory School (ASIST-LS). The main input variable was focused on the topics covered in Grade 1 Mathematics of the ASIST-LS.

The mentioned input was processed by way of documentary analysis. The data resulting from the documentary analysis was used in the courseware development. The developed courseware was validated in terms of visibility, completeness, memorability, navigation, consistency, simplicity, aesthetics, satisfaction, availability, feedback, and educational learning.

The output is the Development of a Courseware for Grade 1 Mathematics. The feedback of the study was based on the results of the courseware being tested and evaluated by the users or respondents which provided room for improvement.

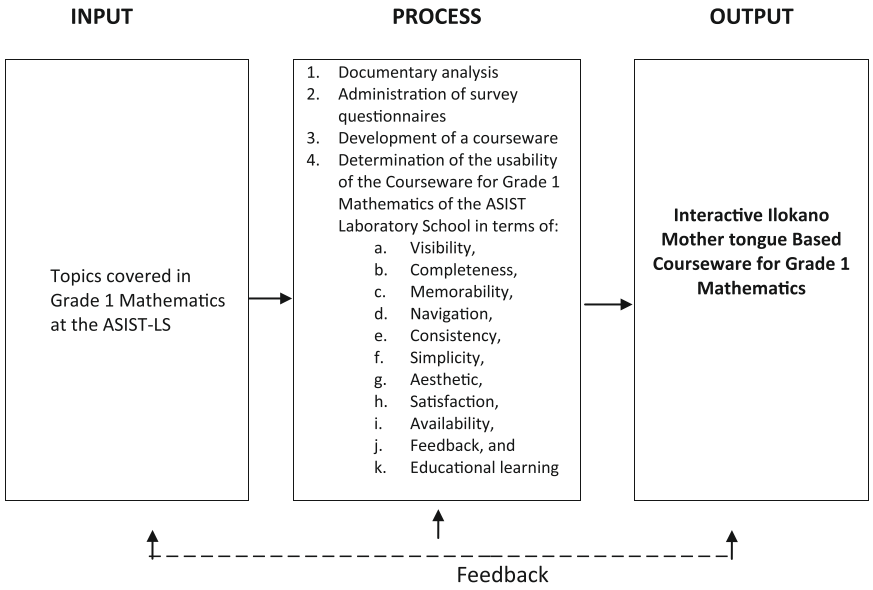


Figure 1. Development Methodology

Sources of Data

Table 1. Distribution of Respondents

Position	N
Grade 1 teacher	1
Grade 1 pupil	25
Total	26

Legend: N – total population

The Grade 1 teacher and the 25 Grade 1 pupils of the ASIST Laboratory School served as the respondents of the study.

The researchers included twenty-five (25) Grade 1 pupils to determine the subjects that they are least interested in and their learning styles in studying Mathematics. The grade 1 teacher was requested to rank her assessment techniques in teaching Mathematics.

Table 1 shows the distribution of the respondents. It was obtained using the total enumeration method. Thus, the Grade 1 teacher and all of the pupils were considered.

Data Instrumentation

For objective 1, documentary analysis was used to identify the topics covered in Grade 1 Mathematics at the ASIST Laboratory School with the aid of the textbook, Grade 1 Math *Aramaten ti Agad-adal Iloko*.

For objective 2, the ADDIE model was used. It is a systematic instructional design model consisting of five phases: analysis, design, development, implementation, and evaluation. Each step has an outcome that feeds into the next step in the sequence.

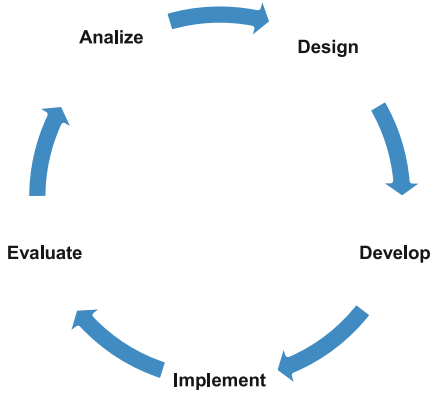


Figure 2. ADDIE Model

In the analysis phase, the requirements of the pupils, the teacher and subject itself were identified and carefully understood most especially on the topics that must be covered throughout the year and how they must be presented in class. In the design phase, the user experiences of both the pupils and teacher were considered. In the development phase, development tools such as Hypertext Mark-up Language (HTML), Cascading Style Sheet (CSS) as scripting language, and multimedia editing and production tools such as Wondershare video editor, Adobe Photoshop CS4 and OGG sound recorder. In implementation phase, the software was installed in the teachers' computer along Xampplite for Windows. The Local Area Network was setup to accommodate the smartphones, tablets and laptops of the pupils. Lastly, the evaluation phase. The pupils and the teacher evaluate the software.

For objective 3, a survey questionnaire designed by Khan and Rahman (2009) to evaluate multimedia systems was adopted and translated in Ilokano.

According to Jaafar, 2008, usability evaluation provide answers regarding whether the system was designed and developed according to the user's requirements**.**

Data Analysis

In relation to the usability of the Courseware, the data gathered were interpreted using the Likert scale with the corresponding descriptive ratings. The variables with responses within the mean range of 2.60 to 5.00 were interpreted as "Usable" while those variables with responses within the mean range of 1.00 to 2.59 were considered as "Not Usable."

RESULTS AND DISCUSSION

Topics Covered in Grade 1 Mathematics

The topics covered in Grade 1 Mathematics of the ASIST-LS were identified through the textbook entitled "Grade 1 Math *Aramaten ti Agad-adal Iloko*." The topics covered in Grade 1 Mathematics were divided into Quarters 1 and 2, and Quarters 3 and 4. Quarters 1 and 2 consist of *Maysa Inggana Sangapulo* (1-10), *Sangapulo ket Maysa Inggana Duapulo* (11-20), *Duapulo ket Maysa Ingana Limapulo* (21-50), *Limapulo Inggana Sangagasut* (50-100), Skip Counting by Twos, and Skip Counting by Tens. Quarters 3 and 4 consist of *Panagkissay iti Numero* (Subtraction), *Panagnayon iti Numero* (Addition), *Sukog* (Shape), *Panagusar iti Kalendaryo – Dagiti Aldaw iti Makalawas ken Makatawen* (Using the Calendar—In a Week and a Year), *Panagusar iti Kalendaryo – Dagiti Aldaw iti Makabulan* (Using the Calendar—In A Month), and *Panangidilig ti Bambanag* (Comparison of Things).

This interaction implies that the topics covered in Grade 1 Mathematics of the ASIST-LS are presented in Ilokano language. The finding is consonance with the Department of Education (DepEd) order number 16, series of 2012 requires the implementation of the Mother Tongue-Based- Multilingual Education (MTB-MLE) starting School Year (SY) 2012-2013 in all public schools, specifically, in Kindergarten, Grades 1, 2 and 3 as part of the K to 12 Basic Education Program.

Development of a Courseware for Grade 1 Mathematics

The Courseware for Grade 1 Mathematics at the ASIST Laboratory School was developed based on the ADDIE Model.

Analysis

In the analysis phase, the requirements of the pupils, the teacher and subject itself were identified and carefully understood most especially on the topics that must be covered throughout the year and how they must be presented in class.

Design

The interface of the software was presented in multi-colors to attract the attention of the pupils. Pink color was placed in the background since most of the pupils were girls. Topics and assessments were presented in videos with audio dubbed in Ilokano. Likewise, the user experience of both the pupils and the teacher were considered.

Development

The Graphical User Interface template was generally designed using Bootstrap, a Cascading Style Sheet (CSS) framework, to develop a responsive courseware. It facilitates a Rapid Application Development (RAD). It lessens time to spend in writing coding of the courseware. Likewise, multimedia editing and production tools such as Wondershare video editor to recreate the videos. In addition to this, Adobe Photoshop CS4 was used to create the banner. Lastly, OGG sound recorder was used to dub to Ilokano audio.

Plate 1. Home Page

The menu bar contains the links for Home, Quarters 1 and 2, Quarters 3 and 4, ASIST VMGO and Acknowledgement Page. Lastly, the body contains the links to the Topics.

Plate 2. Video Contents Page

Plate 2 provides the video content of the courseware. It allows the Grade 1 pupils to select the lesson they want to learn. The image serves as a button, just hit the image button to watch multimedia-based lessons.

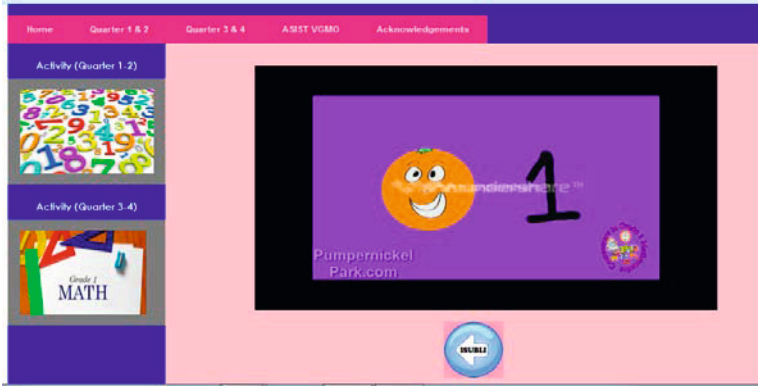


Plate 3. Video Watching Page

Plate 3 allows pupils to view multimedia-based lessons. The videos were narrated by the selected 4th Year IT students.

Plate 4. Quiz Page

Plate 4 is one of the assessment pages. Assessments are in the form of multiple choices. The images serve as choices. Pupils must have to click the image corresponding to the selected answer. In return, the courseware feedbacks the answer.

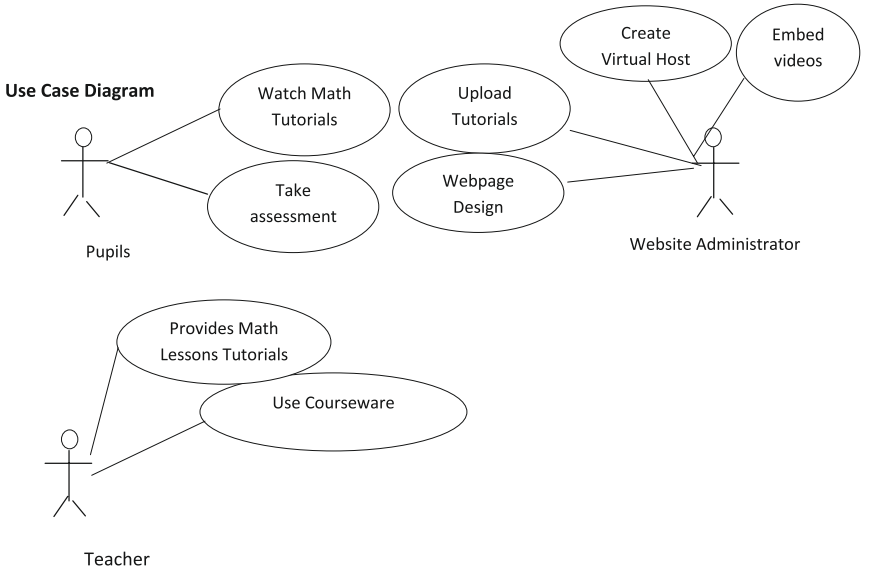
This finding implies that the teacher has now the tool to attract the attention of the pupils to learn the lessons in Grade 1 mathematics using the gadgets that they play with most of the time, like smartphones and tablets. Pupils can play and replay the lessons and activities. Therefore, pupils can master the topics at their own pace. While doing so, the comprehension skills of the pupils are also recorded electronically. This finding is similar to the study of Parnell and Bartlett (2012) on the use of smartphones and other digital technology devices in early childhood education as means of documenting students' daily progress. Moreover, Çuhadar, Odabaşı, and Kuzu (1970) in their study entitled, "Evaluation of mlearning in special education context" used Mobile Technologies to teach Students with Hearing Disability and concludes that individuals who need special education can use technology for instructional facilities. The rich multimedia resources brought by the mobile technologies to the learning settings create a bigger education potential with time and place flexibility.

Table 2. Summary of the Usability of the Developed Courseware for Grade 1 Mathematics

Indicator	Mean	Descriptive Equivalent Rating	Descriptive Interpretation
1. Visibility	4.41	Strongly Agree	Usable
2. Completeness	4.08	Agree	Usable
3. Memorability	4.35	Strongly Agree	Usable
4. Navigation	4.08	Agree	Usable
5. Consistency	3.73	Agree	Usable
6. Simplicity	4.46	Strongly Agree	Usable
7. Aesthetics	3.85	Agree	Usable
8. Satisfaction	4.19	Agree	Usable
9. Availability	3.65	Agree	Usable
10. Feedback	4.12	Agree	Usable
11. Educational Learning	4.73	Strongly Agree	Usable
Grand Mean	**4.16**	**Agree**	**Usable**

Table 2 shows the summary table on the usability of the developed Courseware for Grade 1 Mathematics at the ASIST-LS. It is evident that the respondents agreed that the indicator "Educational Learning" with a mean rating of 4.73 described as "strongly agree" and interpreted as "usable" which means that the respondents perceived that the courseware is easy to learn. On the other hand, the least rating mean of 3.65 described as "agree" and interpreted as "usable" was given to indicator "availability" which means that the users perceived that the topics needed to be discussed in Grade 1 mathematics are all present for the learners in the courseware.

This implies that both the teacher and pupils agreed that the courseware was usable. It is along this context, that courseware for mathematics be used in the classroom setting as alternative method of teaching mathematics for grade 1. This finding supports the finding of S. Z. Ahmad, N. A. Ahmad, Rosmani, Ismail, Mazlan, and Ekhsan, (2015) that interactive multimedia environment can motivate the preschooler to be prepared for future mathematical learning.



Use Case Diagram

For the software to meet its best performance, it should have the proper hardware required. For the implementation of courseware, the following computer hardware are needed: 1) Intel Celeron Processor G1820 (2M Cache, 2.70 GHz); 2) 2GB DDR3 SDRAM; 3) 500GB; 4) DVD-RAM/±R/±RW; and 5) Gigabit Ethernet.

Software requirements

The following software should be installed for the successful implementation of the system: 1) xampplite for Windows; and 2) Internet Browser (e.g., Mozilla Firefox).

Local Area Network

- ✓ Wireless router

Mobile Friendly

- ✓ Laptop
- ✓ Tablets
- ✓ Smartphones

Critique to the methodology

Bootstrap, a Cascading Style Sheet (CSS) framework, is an excellent tool to develop a responsive courseware. It facilitates a Rapid Application Development (RAD). It lessens time to spend in writing codes of the courseware.

CONCLUSION

The Grade 1 mathematics is being taught at the Laboratory School using Ilokano. The ADDIE model is appropriate in the courseware development. The usability test result conducted by the both the pupils, who used the Ilokano version of the questionnaire and the teacher implies that the courseware was useful. The courseware that is viewable using the smartphones and tablets attracts the attention of the pupils. It provides the pupils' ability to repeat the topics and activities that lead them to master the lesson at their own pace.

TRANSLATIONAL RESEARCH

The outcome of the study had been translated into Courseware Development Guide and was used by the Bachelor of Science in Information Technology (BSIT) students. The guide provides additional concepts on how to create courseware. The translation of the study results was made possible by the Abra State Institute of Sciences and Technology-College of Arts and Sciences Department.

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