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Editorial correspondence should be addressed to: The Editor-in-Chief, Annals of Studies in Science and Humanities, Caraga State University, Ampayon, Butuan City, 8600 Philippines, or e-mail at jassh@carsu.edu.ph.

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Best Practices in Developing Reading Proficiency in the Mother-Tongue Among Public Schools in Butuan City

Miraluna L. Herrera[2,*] *& Bryan M. Luzon*[1,]
[1]Department of Education - Agusan; Ampayon Central Elementary School, Butuan City, Philippines, 8600
[2]College of Education, Caraga State University, Ampayon, Butuan City, Philippines, 8600

ABSTRACT

The purpose of this paper is to determine best practices in the implementation of mother tongue (MT) as a subject in primary education – grades I, II and III. Accordingly, this paper examined the efficacy of mother-tongue-based instruction (MTBI) strategies in developing reading proficiency of primary graders. To address this research goal, the mixed method design embedded in correlation model was used. Survey questionnaires were administered to teacher and learner participants chosen at random from the elementary schools of East 1 Butuan District. Percent and mean were used to describe extent of practices and reading proficiency while pearson correlation or spearman correlation was used to describe and test correlation. Findings show that MTBI strategies such as making instructional materials, listening with MT words, translating first language (L1) to second language (L2) and vice versa, use-of- imagination strategy, team-building strategy, and strategy for cognitively challenged were highly employed in the schools of East 1 Butuan District while integration of technology and reading MT words are of moderate manifestation. Pupils have frustration or poor proficiency in terms of reading fluency which needs remediation while they are independent or have high proficiency in terms of listening and comprehensions skills. Analysis of the results and findings shows that the best practices in the MTBI include strategies on listening with materials in MT such as listening with Visayan stories and listening news from local radio station, on using of imagination and on making of instructional materials.

Keywords: best practices, Mother tongue, MTBI strategies, reading proficiency

1 Introduction

One of the changes in Basic Education Curriculum (BEC) brought about by the new K-12 program is the introduction of Mother Tongue-Based Multilingual Education (MTB-MLE) specifically in Kindergarten and in Grades 1, 2 and 3 to support the goal of "Every Child-A-Reader and A-Writer." The program is meant to address the high functional illiteracy of Filipinos where language plays a significant role (Williams, Metila, Pradilla & Digo, 2014). Everyone is expectant on the outcomes of this newly implemented program;

*Corresponding Author
*E-mail: miraherrera71@yahoo.com

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thus, an assessment of some best practices in the implementation of MTBI will certainly contribute to the improvement of the program implementation.

Studies conducted along MTB-MLE reveal a great advantage of the curriculum on the language development of the learners. A large body of evidence from different countries as well as advances in the field of cognitive neuroscience show that children who have access to MTB-MLE develop better language skills in their mother tongues as well as national languages (Ministry of Education and Culture, 2014). It is claimed that when knowledge of a second language (L2) is added to a rich knowledge of a first language (L1), a child forms complex knowledge networks (additive bilingualism). Hence, having access to learning in more than one language also allows individuals to use different languages for different functions. On the contrary, children who have limited vocabulary in their first language will not benefit as thoroughly from bi/multilingual instruction and will use elements of the second language to replace the first (Ganschow, Sparks & Javorsky, 1998). Given that language and literacy develop during a child's first five years, early childhood educators need to make a conscious effort to intentionally plan activities and experiences that optimize conditions for children to acquire positive attitudes, skills, and knowledge about language and literacy (Neuman, Copple & Bredekamp, 2000).

However, the implementation of MTB-MLE in the Philippines is challenged primarily with the teachers' weak understanding of the curriculum and cynicism that this curriculum would work in the local setting with no definite mother tongue. Early in the work of Williams, et al. (2014) revealed MTB-MLE challenges such as limited MT pedagogic discourse, teachers' low proficiency in MT, teachers' feeling of forced compliance with the policy, teachers' difficulty to distinguish learning competencies and differences between Filipino subject and MT subject, and, teachers' confusion about spiraling for MT subject and Filipino subject and a lot more. Neuman, et al. (2000) pointed that a teacher's role is critical to a child's learning and that teachers can inspire children to read, write, and learn through thoughtful planning and developmentally appropriate literacy instruction.

Hence, the best practices that will be captured in this research will restate the importance of MTB-MLE programs in schools, review and analyze the MTB-MLE program and its implementation in the local context of the Philippine setting. The main purpose of this paper is to determine some best practices in the implementation of MTBI in the primary grade level. These best practices are determined from MTBI strategies employed by the teachers that significantly and positively influenced the reading proficiency of the primary learners. Specifically, this study is aimed to identify the strategies employed by the teachers in the MTBI; determine the reading proficiency of the learners in terms of reading fluency, listening skill and comprehension skill; and correlate the extent of teachers' implementation of MTBI strategies and the learners' reading proficiency. Hypothesis on the correlation between the extent of implementation of MTBI strategies and learners' reading proficiency is also tested.

2 Conceptual Framework

This study was anchored on the theory on readiness for change, middle-range theory and expectancy-value theory (Peach, Jimmieson & White, 2005; Talvio, Berg, Ketonen, Komulainen, & Lonka, 2015; Wong, Greenhalgh and Pawson, 2010). These theories are intertwined to establish the hypothesis of this present study; that is, there were MTBI strategies employed by teacher implementers that developed the reading proficiency of the primary grade learners in the East 1 District of Butuan City.

Readiness for change is a concept approached at either organizational or an individual level in organizations in various areas – education, health, industry, finance etc. Peach, et al. (2005) described readiness for change as individuals having positive thoughts of necessity for change and change will be favorable for both themselves and the one they serve. Whatever the aim or content is in the process of system changes, the most important issue that should not be forgotten is the leading actor in such changes. Hence, with the change in the educational landscape, it is not possible to accomplish the purported change successfully without taking the teachers' thoughts and attitudes into consideration. Otherwise, it is more likely for teachers to show resistance to the change practices which are planned and developed independent

of themselves (Inandi & Gilic, 2016). One of the most controversial changes that K-12 program has made into the Philippine educational system is the MTB-MLE curriculum. Accordingly, those primary teachers who responded well to this curriculum were those teachers who were ready for changes – those who have positive thoughts for changes to bring favorable outcomes.

On the other hand, implementation of the MTB-MLE can be evaluated using the middle-range theory. Wong, et al. (2010) defined middle-range theory as a theory at the correct level of abstraction to be useful. Moreover, this theory stresses that an underlying mechanism helps explains an outcome across contexts (Wisdom, Chor, Hoagwood, & Horwitz, 2013). Teachers' strategies of MTBI are some processes or techniques so that adoption of the new program can be made meaningful in the lives of the learners. These strategies are employed by the teachers with the belief that they can encourage active participation by children in the learning process – children understand what is being discussed and what is being asked of them. They can immediately use their mother tongue to construct and explain their world, articulate their thoughts and add new concepts to what they already know. Moreover, expectancy-value theory (Eccles & Wigfield, 2002) posited that expectancies and values influence one's performance. Expectancies refer to beliefs about how a learner performs on different activities, while values refer to the reasons for completing an activity. Thus, expectancies and values influence teachers' decisions and predict learners' levels of engagement, interest and academic success. Hence, expectancies and values affect teachers' performance, as well as learners' social and emotional learning outcomes (Talvio, et al., 2015).

Accordingly, this study conjectured that the learners' reading proficiency in MT in terms of reading fluency, listening skills and reading comprehension is significantly influenced by the MTBI strategies employed by the teachers such as reading MT words, listening with MT, translating L1 to L2 and vice versa, use-of-imagination strategy, team-building strategy, integrating technology, and use of differentiated activities for cognitively challenged. These strategies devised by the teachers determined by their readiness, understanding and valuation on the multilingual education (MLE) play a crucial in the learners' language development with the mother tongue and other languages. It is assumed in this study that MLE can produce high levels of multilingualism among the learners and even among teachers. Study revealed that high-level multilingual group often does better than corresponding monolingual on tests measuring several aspects of intelligence, creativity, divergent thinking and cognitive flexibility (Skutnabb-Kangas, 2009).

As practiced, the medium of instruction in the Philippine educational system has been the English language for the majority of the school subjects. In particular, the MTB-MLE as implemented focused on bilingualism – the mother tongue (L1) and the English language (L2). Cummins (as cited in Paul Stone, 2012) defined two main types of bilingualism – (1) the additive bilingualism, in which L1 is continually developed as well as the home-culture value while L2 is added and (2) the subtractive bilingualism in which the L2 is added in favor to L1 and its culture that serves as an option. Hence, reading materials need to be culturally relevant to the students' culture so that they may focus on developing reading skills rather than understanding the context of the story (Brown, 2014). If any translation were to be done, it would not sound very successful when translation into a foreign language and culture is not based on the cultural aspects of the foreign or second language because the translator is an alien to that culture regardless of the cultural references or phrases he/she memorizes (Newmark, 1988).

In developing fluency of reading, the skills gained during L1 reading such as visual and phonemic awareness, and speed of processing automatically contribute to reading the L2 and any other language even when the languages are typologically different and/or have different writing system. Reading comprehension skills allow readers to move from elementary reading to effective reading. Traditionally, reading begins as an exercise in decoding letters and sounding out word which is passive reading. Comprehension is the essence of reading and the active process of constructing meaning from text (Durkin, 1993). Moreover, the widely accepted model of the reading process (Gough & Tunmer, 1986) theorized that listening skill makes reading comprehension possible. Listening skill goes beyond what the child hears in his/her environment; rather, it is the ability of the child to interpret what is being heard. Hence, an increase in the listening comprehension will also increase the child's reading ability.

3 Research Methodology

This study employed the descriptive research design particularly the mixed method established by Green and Caracelli (as cited in Creswell, 2014). More precisely, the embedded design in correlation model was utilized as follows: (1) quantitative data were used to answer the research questions in a correlational design using survey questionnaires and test questionnaires, and (2) qualitative data are embedded within the correlational design with the intent of explaining the mechanisms that relate the predictors and outcome variables.

The research locale, the East 1 Butuan District whose office is located in Ampayon, Butuan City, is composed of nine schools with 5 rural schools, namely, Daan Taligaman Elementary School, Imelda Elementary School, Bugsukan Elementary School, Camayahan Elementary Schools, and Basag Elementary School, and 4 urban schools namely, De Oro Elementary School, Taligaman Elementary School, Antongalon Elementary School, and Ampayon Central Elementary. From these schools, the primary participants of the study were composed of grade school teachers and pupils who were selected in a multi-stage process. Stratified random sampling was done in the selection of participating schools based on the list of schools as classified in the District. From each participating school, teacher participants were randomly selected – 50% from large school while complete enumeration for small schools as representative sampling. Finally, three pupil participants were randomly selected from the list of each teacher participant. The pupil participants' mother tongue used at home and in the community is Cebuano. As to their profile, these pupils were classified regular in the present grade level, 63.3% female and 35.7% male and equally distributed in the grade levels 1, 2 and 3.

Two (2) types of instruments were used in this study. The first instrument is a test questionnaire for pupil participants comprised of three (3) parts – reading fluency, listening skills, and reading comprehension. This questionnaire was adapted from the Philippine-Informal Reading Inventory (Phil-IRI). For the validation, the instrument was evaluated by three experts for face and content validity and was pilot-tested in randomly sampled 30 primary grade school learners in F.R Sibayan Central Elementary School located at Baan Km.3, Butuan City. The second instrument is a survey questionnaire for teacher participants from Brown (2014) comprised of two parts – the demographic profile and the 20 semi-structured questions for MTBI strategies. Quantitative responses were scored in 4-point Likert scale; to wit, 4 for always, 3 for oftentimes, 2 for often and 1 for never. Again, it was subjected to the evaluation of three experts for improvement and validation.

Preliminary activities such as seeking permission from the Department of Education (DepEd) - East Butuan District 1 and setting schedule were done prior to the actual data gathering. Participation was voluntary and a statement of the informed consent was included in the questionnaire. The conduct of the data gathering was done separately for the teacher and pupil participants. During the actual data gathering, a validated test questionnaire was administered to the pupil participants. A brief orientation on the background, nature and scope of the study was given prior to the distribution of questionnaire. On the other hand, a survey questionnaire was also distributed to the teacher participants. A follow-up interview was done after the accomplished questionnaire was retrieved. Other means such as online and text messaging, and through email were employed to validate the responses of the teacher participants.

Data analysis employed descriptive measures and correlation analysis. The extent of implementation of MTBI practices were summarized by computing the mean interpreted as follows: 1.00-1.49 as very low, 1.50-2.09 as low, 2.10-2.89 as moderate, 2.90-3.49 as high, and 3.50-4.00 as very high. Reading proficiency in mother tongue is determined in terms of reading fluency, listening skill and comprehensions skill. Reading fluency was measured in terms of percentage of the number of words correctly read (PNWCR); listening skill was computed from the total score obtained from the rubric on spoken dialect divided by the total score times 100%; and comprehension skill was computed from the correct answers to questions from the selection divided by the number of questions times 100%. Finally, correlation analysis was performed with the mean percent scores to determine significant relationship between the extent of MTBI practices and the pupil's proficiency in mother tongue. Since data gathered were non-normal, spearman rho correlation was used to test relationship. Test was gauged against 10%, 5% and 1% level of significance.

4 Results and Discussion

Teacher implementers of East 1 Butuan District employed the enlisted strategies in mother-tongue based instruction (MTBI)(Fig 1). Overall results show that practices were employed to a high extent (mean ratings that range from 3.00 to 3.47) except for two (2) practices, namely, reading MT words and integration of technology.

4.1 Use-of-Imagination Strategy

The use-of-imagination strategy has the highest mean rating (mean = 3.47) with high extent of utilization. The teacher participants confirmed that this strategy is highly employed with the comments, "*Mas dali ihatag ang instruction basta bisaya. Dali rami magkasinabot sa mga bata.*" (Instruction in mother tongue is easier. Children can easily understand.)

In here, the mother tongue is used for instruction or in giving direction on the use-of-imagination activity. This suggests that the teacher can easily facilitate the activity on the use of imagination through mother tongue. The use of imagination is the ability of the learners to form a picture in their mind on something that is not seen or experienced.

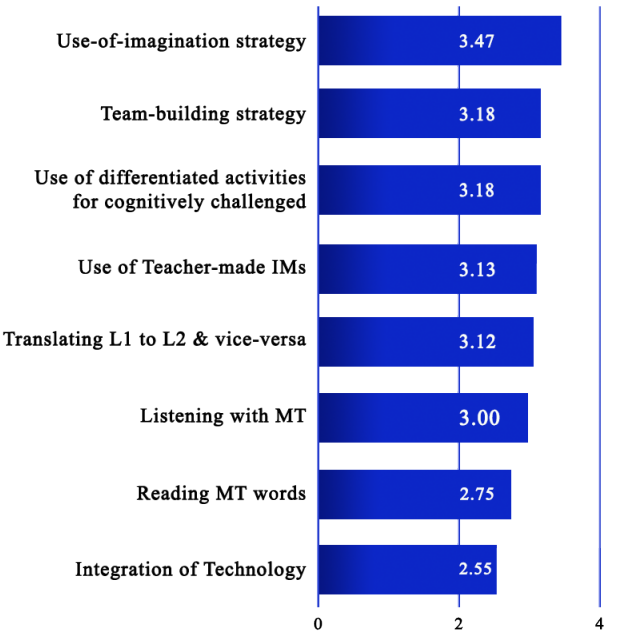

Fig 1. Mean ratings on the extent of MTBI Strategies in East 1 Butuan District

Legend: 1.00-1.49 very low, 1.50-2.09 low, 2.10-2.89 moderate, 2.90-3.49 high, and 3.50-4.00 very high

More precisely, the preceding finding can be viewed in the context of the cognitive and emotional value of learning in mother tongue. Imagination is more potent when emotional or affective sense is reassured especially for minority who struggle to be recognized. Accordingly, minority pupils feel more respected when the mother tongue is used (Dutcher, 2003). Moreover, many initiatives around the world provide formal support for children to continue to develop competence in mother tongue and self-confidence as learners while also learning an additional language or languages.

Other highly employed MTBI strategies are the use of differentiated activities for cognitively challenged (Fig 2) and team-building strategy (mean = 3.18) (Fig 3).

4.2 Strategy for Cognitively Challenged

Some activities for the cognitively challenged were the lighter activity (mean = 3.37) and special class mentoring (mean = 3.00). Lighter activity refers to some less-laborious equivalent task designed separately on a particular competency for the cognitively challenged. This activity is further supplemented with a special class mentoring. Some teachers commented that "*Mas maayo man gyud kini ang buhaton sa mga hinay pa kaayo para mas dali nila masabtan ang gusto nato ipasabot. Mas maayo ug naay special treatment sa mga nag-need ug tabang para mas ma-feel nila nga love sila ni teacher.*" (It is better to do these [the differentiated

activities] for the slow learners- for them to comprehend what we impart. Special attention should be given to those who need it so they will feel that their teacher cares for them.)

Responses from the teacher participants stressed that strategies for cognitively challenged pupils are more achieved in the use of MTBI. These results show that the teachers employed varied activities that will provide some special treatment for those who are deficient in global intellectual performance, as with intellectual disabilities and specific deficits in cognitive abilities. Similarly, implementation of activities in MTBI that promote teamwork and trust is evident in the primary levels.

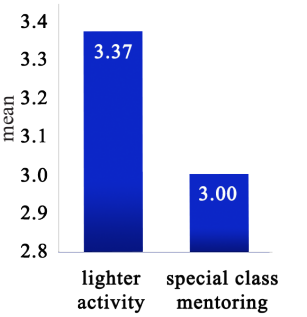

Fig 2. Differentiated activities for cognitively challenged

4.3 Team-Building Strategy

Some highly employed practices in the team-building strategy were implemented using 'laro ng lahi' (mean = 3.20) and group activity with instruction in mother tongue (mean = 3.17) (Fig 2). Plainly, teacher participants defined team-building strategy through local games to fit into the MTBI. Their simple implementation of this strategy was group activity using games or tasks with Visayan instruction. In fact, teachers pointed out that "*Dali ra para sa mga bata sabton ang instruction kung bisaya. Mas okey lang nga e-bisaya ang instruction.*" (Use of mother tongue makes instruction comprehensible to pupils). Thus, this strategy was claimed to be highly employed but not in the depth of its application. Teachers' common knowledge about this strategy is only for learners working together to easily understand each other and generate ideas in their own language. MTBI should enable rich communication and deeper participation of students, helping learners feel more confident, and building a sense of identity in the classroom (Paul Stone, 2012).

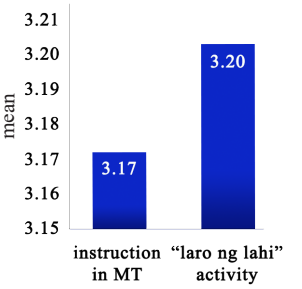

Fig 3. Practices for team-building strategy children

4.4 Use of Teacher-Made Instructional Materials (IMs)

Following in the highly employed MTBI strategy is the use of teacher-made instructional materials (IMs) (mean = 3.13) (Fig 1). Teachers constructed IMs that are contextualized according to the learners' needs. Most often, these teacher-made IMs utilized localized or indigenous materials that are readily available in the school or in the immediate community. As usually practiced, big books and small books are essential materials for teaching in the primary levels. The use of teacher-made IMs was commendable among teacher participants as expressed in their claims such as "*translated stories in bisaya is better than stories in English language, para mas makita sa mga bata ang mga dagkong drowing ug mabasa pag-ayo.*" (for children to easily see the big pictures and read properly.) According to Krashen (1981), the learning materials developed tend to promote authentic language learning and higher order thinking and reinforce learning across the curriculum, especially for those learning a language as both a target language and a medium of instruction.

4.5 Translating L1 to L2 and Vice Versa

Translating mother tongue (L1) to English or Filipino language (L2) and vice versa marked as one of the highly employed strategies in the MTBI (mean = 3.12) (Fig 4). Some practices in translating L1 to L2 and vice that were manifested in the MTBI; to wit, the interpretation of some segments of English film to MT (mean = 3.03), listing of English films used (mean = 2.90), interpretation of some segments of Tagalog film MT (mean = 3.30), listing of Tagalog films used (mean = 3.17) and interpretation of story (mean = 3.20).

These practices are highlighted by teacher participants saying that "*Mas dali masabtan kung ginabisaya ang kada panghitabo sa salida. Daghan, dili ra man sab cartoons lang. Naa sab kanang pambata nga sineskwela, mathinik nga gina-provide sa DepEd*." (It is easier for children to understand if events in the film are translated to mother tongue. Not just cartoons, there also are a lot of programs for children provided for by DepEd such as sineskwela, mathinik, and many more.) Apparently, there is an evidence that teachers in the field were implementing diverse activities that were recommended and were innovating additional materials to make MTBI meaningful. They even found interpreting English films beneficial and not a burden. These positive outlooks from among the teachers in the primary grade levels simply showed their readiness to embrace the change as brought by the K-12 implementation in the country. This is in conformance to what Brown (2014) emphasized that translation activities are geared towards developing reading skills among children and not only on the understanding of the context or story of the materials.

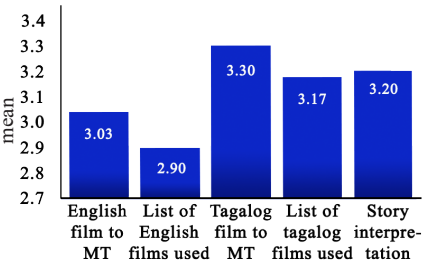

Fig 4. Practices on Translating L1 to L2 & vice versa

4.6 Listening with Mother Tongue (MT)

Listening with mother tongue is another MTBI practice revealed to be highly employed (mean = 3.00) among teacher participants. Some particular practices which are highly manifested in the responses of teachers are listening news from local radio station (2.90), integration of Visayan song (2.90) and following directions in mother tongue (3.20) (Fig 5).

The most evident among the practices in listening with MT is the use of MT in directions or instructions. Instructions in MT, according to the teacher participants, were "*mas dali sabton bisaya; mas dali sa mga bata*" (more comprehensible; makes it easier for the children). This practice in listening with MT is also very natural for teachers to devise, less effort and very practical in their day-to-day classroom activities.

As to the practice on listening with local news, more specific strategies were revealed as follow: "*Para ma-test ilang* (To test their) listening skills, I ask them [children] to listen to some local news as an assignment once a week; only just to check if they really understand the local news." These practices are of great help in improving pupils' listening skill and comprehension skill as claimed by the teachers, thus, their frequent use of the strategies. However, some teachers also commented that these practices were not carried out due to non-availability of radio both in school and/or at home. Considering that some schools in East 1 Butuan District were located in the urban settings, some homes of the grade school learners do not have a radio; children were most exposed to television programs and online resources.

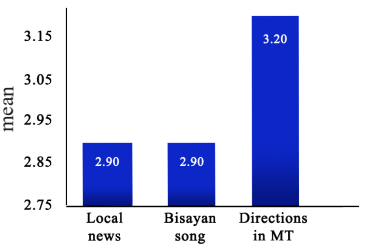

Fig 5. Practices on listening with MT

The integration of Visayan songs as practice for listening with mother tongue is found to be necessary among teacher participants. As some of their comments reveal: "*hilig man jud nila ang magkanta-kanta. Mao nang kun kinahanglan mag-mugna ug bisaya nga kanta, buhatan dayon.*" (Children are fond of singing that is why Visayan songs are composed if desired.) Also, teachers found Visayan songs enjoyable among learners as contained in the following comments: "*Para mabibo ang klase ug masabtan ang suliran sa kanta, para ganahan ang mga bata mosulod sa klase-- mas dali nila ma-memorise ang kanta basta bisaya.*" (This is for children to enjoy the class and help them solve the riddles in the song, for them to be encouraged to attend the class—it is easier for them to memorize Visayan song.)

Teachers found the urgency and necessity to compose Visayan songs due to the scarcity or non-availability of Visayan songs for children. According to them, "*Wala pa kaayo mga nursery rhymes nga bisaya. Wala*

kaayo time para ma-translate ang ubang kanta." (Visayan nursery rhymes are lacking. Also, we are short of time to translate known songs to MT.) This perhaps is one of the challenges that teachers should be addressing to improve MTBI in the primary levels. These results suggest some training or capability building for primary grade levels in the composition of nursery rhymes and relevant songs for school children. This activity will also provide opportunities for the contextualization and localization of instructional materials in a form of song. DepEd may also devise some venue to invite song writers to submit their pieces for instructional purposes.

The practices on reading MT (mean = 2.75) and integration of technology (mean = 2.55) are moderately implemented among the MTBI strategies as shown in Figure 1. The subsequent sections present both the quantitative and qualitative analyses on these aforementioned strategies.

4.7 Reading Mother Tongue

Fig 6 shows the four (4) practices implemented in reading MT. It is worth noting that reading Visayan sight words was highly manifested (mean = 3.27) along with reading Visayan short stories (mean = 2.77) and reading Visayan newspaper (mean = 2.70) while reading big books and small books (mean = 2.27) was moderately implemented.

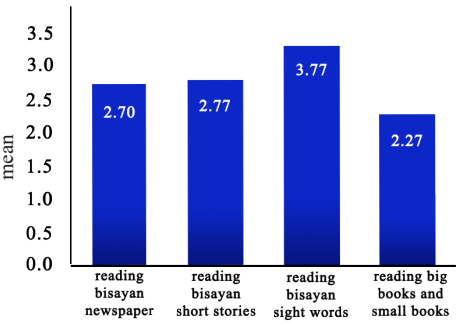

Fig 6. Practices on reading MT

Reading Visayan *sight words* was highly implemented since it is necessary and basic according to the teacher participants. This concept is revealed in their answers such as "*kinahanglan ug basic man. Dapat maoy una.*" (These [sight words] are important as these are part of the basics. These must be taken up first.) Memorizing *sight words* is the basic technique employed because according to them this will facilitate reading MT. This claim is contained in their responses such as "*Dali pag i-memorize. Mas maayo ma-memorize dayon ang mga basic sight words.*"(It is better and easier to memorize the sight words.)

Several reasons were given as to reading Visayan news as one MTBI practice employed by teachers in reading MT. One is learning to use newspaper as part of learners' preparation as spelled out in their responses like "*Para makabalo sab ang mga bata unsaon pag gamit sa newspaper.*" (This is so that the children learn what a newspaper is for.) Another reason given was for information about the local events and updates expressed as "*Ma-aware ang mga bata sa local nga balita. Mas dali nila masabtan ang mga panghitabo sa palibot kung nagabasa sila niini; para updated.*" (Children will be made aware of the local news. They will understand what is happening around them if they read newspapers. They will get updates.) Finally, reading Visayan newspaper was for facilitating learning in language proficiency as teachers believe that "*mas maayo makabalo-balo ug basa sa bisaya nga newspaper adeser sila sa lain nga linggwahe.*" (It is much better if children learn to read through Visayan newspapers before learning the other language.) Clearly, teachers implemented the additive bilingualism approach of Cummins (as cited in Paul Stone, 2012). Teachers in the East 1 Butuan District were more positive that learning the L1 would be more meaningful if learned prior to learning any other language. As a matter of fact, children especially in the urban areas are most conversant in L2 than in L1. This is one of the challenges that teachers were confronted with in the implementation of the MTB-MLE.

On the other hand, reading big books and small books was least practiced among teachers in reading MT in the District. Unanimously, teachers revealed lack of materials for MTBI in their classroom. Aside from lack of provision from DepEd itself, teachers were also constrained to devise their own big-books and small books due to lack of financial assistance. Aside from financial dearth and resources shortage, teachers do not have sufficient time to develop or construct these materials. These results are quite alarming considering that local materials are much needed for the effective implementation of MLE. Also, reading proficiency of

the primary grade school learners can be developed successfully only with the use of culture-based materials (Brown, 2014) that are adapted with local translation (Newmark, 1988) and equivalent translations that are neutral and inoffensive (Baker, 2011).

4.8 Integration of Technology

The least implemented MTBI strategy among the categories identified in this study was the integration of technology (Fig 7).

Use of audio-visual materials (mean = 2.73) was more likely employed than use of computer-based IMs (mean = 2.37). Teachers believed that integration of technology is of more advantage as they expressed as "*Mas maayo nga naa sab gamit ang technology sa klase hilabi nag pwede na bisaya ang instruction. So, maka-pabor jud ug sabot ang mga bata.*" (It would be advantageous for children if technology will be used in class with Visayan instruction.) The teachers were aware of the need of technology application and interactive materials in the classroom. However, they were challenged to develop their own materials in MT so that learners will really see or visualize the MT word along with the graphics and pictures in the presentation.

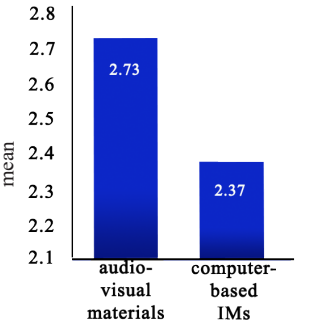

Fig 7. Practices on integration of technology

Computer-based instruction was not much used since most of the schools in the District do not have available facilities and equipment for the said strategy like source of electricity, laptop and internet connectivity. Responses of teacher participants included such as "*Walay kuryente sa bukid. Walay wifi. Walay signal sa bukid. Useless ra.*" (There is no source of electricity and internet connectivity in the highland. It is useless.) With this scarcity of resources, teachers' integration of technology was limited only on either multimedia or audio-visual presentation.

Also, teachers were still constrained with pupils reading deficiency and found the use of technology not compelling. According to the teacher participants, their pupils were still non-reader and it would be useless to integrate technology. "*Useless ra ilang nihabaw-an ug aha motoplok kay ultimo pagbasa unsa ilang gituplok sa computer dili kabasa.*" (It would be useless to use computer in teaching since children do not even know how to read the letters in the keys.) According to them, however, these practices on technology integration were practical or less expensive than the bigbooks and small books. What makes this strategy challenging is the use of technology itself in the preparation of the IMs. Teachers still lack the necessary skills in basic information technology which led to least utilization among teacher participants in the District.

The results above suggest that teachers implemented diverse strategies in dealing with MTB-MLE program with the goal to maximize the learning outcomes with the aid of mother tongue instruction. According to Neuman, et al. (2000), a teacher's role is critical to a child's learning and that teachers can inspire children to read, write, and learn through thoughtful planning and developmentally appropriate literacy instruction. Thus, teachers' readiness and understanding of the MTB-MLE should be developed further for the success of the program implementation.

4.9 Reading Proficiency in Mother Tongue (MT)

Reading proficiency is measured in the three (3) areas, namely, reading fluency, listening skills and comprehension skills. Overall results show that pupil participants were proficient in mother tongue except for the reading fluency (Fig 8A).

Fig 8A shows that the reading fluency is at a frustration level. In particular, the majority (53%) got the highest miscues in reading; that is, pupils were not yet proficient in terms of recognizing words and decoding them properly. This can be traced back to lack or no reading materials available for pupils to practice reading or perform oral reading. Considering that the words in mother tongue have complex form, pupils had difficulty to recognize words with precision or utter the words fluently. Moreover, this difficulty among primary grade learners in recognizing MT words is highly influenced by their high exposure foreign

programs and shows, and reading materials available online and on television. However, there is a significant number of learners (40%) who were at least instructional in their level of reading fluency.

The foregoing results suggest that transition period of the K-12 curriculum has optimized outcomes for MTB-MLE. It cannot be denied that this early outcome of the MTB-MLE showed significant improvement in the reading proficiency of the primary grade school learners despite some lapses that emerged in the implementation process. Whether it is additive or subtractive bilingualism that was applied by the teacher participants, still skills gained during L1 reading under any MTBI strategy contributed to reading the L2 – either English or Filipino.

On the other hand, the majority of the pupils were independent (56%) in terms of listening skill (Fig 8B). It is noteworthy that only a few (about 7%) were in the frustration level and a good number (about 37%) were in the instructional level. These results again supported some successful outcome of the MTB-MLE especially in the transition period. It is worth mentioning that both the linguistic and cultural elements in the source language and the target language were well-observed in order that translation is carried out successfully. Brown (2014) emphasized that translation activities in the MTB-MLE are geared towards developing reading skills among children and not only on the understanding of the context or story of the materials.

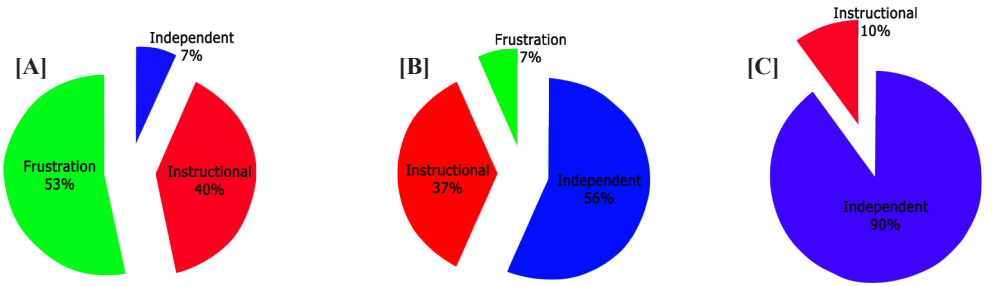

Fig 8. Pupils' [A] reading proficiency, [B] listening skills and [C] comprehension skills in mother tongue

Similarly, the majority (90%) of the pupils in the primary levels were independent with no students in the frustration level (Fig 8C). This is just a natural consequence of the developed reading skills among the learners – an increased reading comprehension (Gough & Tunner, 1986). Listening comprehension is very essential in the future success of the leaners in oral reading comprehension. As pointed out by Teale and Yokota (2000), children learn to process what they hear and read. Hence, teachers should encourage learners to engage in extended conversations by expanding and extending topics, asking questions, and connecting new ideas and information to learners' prior knowledge and experiences. As a whole, language literacy and in particular, reading proficiency will be meaningful and successful if children will be directly oriented on the reading process of MTB-MLE. Thus, identifying effective and doable MTBI strategies will be beneficial to the curriculum implementation.

To give some empirical underpinning on the best practices of the teacher participants in the MTB-MLE implementation in the East 1 Butuan Division, tests of significant correlations were performed between the extent of MTBI strategies and the reading proficiency in the primary grade school levels. Computed correlation statistics provide both the substantial significance (coefficient, R) and practical significance (p-value) on the desired influence of MTBI practices in developing reading proficiency of the primary learners.

4.10 Correlation Between Extent of MTBI Strategies and Reading Proficiency

Overall analysis shows that strategies in reading MT words, listening with MT words, use-of-imagination strategy and use of teacher-made IMs revealed significant positive correlation on the variables of the learners' reading proficiency in MT at 1% and 5% levels of significance. Hence, these MTBI strategies provide the best practices in developing the reading proficiency in MT (Tables 1, 2 and 3). Analysis and discussion of these best practices are provided.

Table 1

Correlation between reading MT word practices and MT proficiency variables

Practices in MTBI	Reading fluency		Listening skill		Comprehension skills	
	R	p-value	R	p-value	R	p-value
Reading Mother Tongue (MT) words	**0.388*****	0.034	**0.408*****	0.025	**0.369*****	0.045
Listening with MT	0.183	0.333	0.247	0.189	**0.349****	0.058
Translation between L1 & L2 & vice versa	0.123	0.518	0.063	0.742	0.162	0.393
Use-of- imagination strategy	-0.123	0.517	0.195	0.303	**0.327****	0.077
Team-building strategy	0.039	0.836	0.116	0.541	0.041	0.828
Use of differentiated activities for cognitively challenged	0.102	0.592	0.126	0.508	-0.044	0.816
Integration of Technology	0.274	0.143	-0.181	0.339	-0.110	0.564
Use of teacher-made IMs	0.169	0.373	**0.389*****	0.034	-0.007	0.972
Integration of Technology	0.274	0.143	-0.181	0.339	-0.110	0.564
Use ot teacher-made IMs	0.169	0.373	**0.389*****	0.034	-0.007	0.972

*** Correlation significant at 1%. ** Correlation significant at 5%.

Table 2

Correlation between reading MT word practices and MT proficiency variables

Strategies in Reading with MT	Reading fluency		Listening skill		Comprehension skills	
	R	p-value	R	p-value	R	p-value
Reading Visayan short stories	**0.495*****	0.005	0.362	**0.049****	**0.401****	0.028
Reading big books and small books	**0.378****	0.039	**0.439****	0.015	0.266	0.156
Reading Visayan newspaper	0.266	0.155	0.185	0.328	0.224	0.234
Reading Visayan sight words	0.034	0.857	0.055	0.773	0.232	0.217

*** Correlation significant at 1%. ** Correlation significant at 5%.

Table 3

Correlation between reading MT word practices and MT proficiency variables

Strategies in Listening with MT	Reading fluency		Listening skill		Comprehension skill	
	R	p-value	R	p-value	R	p-value
listening news from, local radio station	0.246	0.191	**0.501*****	0.005	**0.460****	0.011
integration of Visayan song	-0.031	0.873	0.011	0.952	0.115	0.544
following directions in mother tongue	0.183	0.333	0.063	0.740	0.045	0.814

*** Correlation significant at 1%. ** Correlation significant at 5%.

Analysis on the correlation between the extent of reading MT words and reading proficiency yielded significant results. That is, the extent of reading MT words is significantly correlated with reading fluency (R = 0.388, p-value = 0.034), listening skills (R = 0.408, p-value = 0.025) and comprehension skills (R = 0.369, p-value = 0.045). Hence, learners who got high scores in reading fluency, listening skills and comprehension skills tests were under the classes of the teachers who had implemented reading MT words to a high extent. Specific activities with reading MT words and reading proficiency correlations are presented in Table 2.

The strategy on listening with MT also yielded significant positive correlation with reading comprehension of the primary learners (R = 0.349, p-value = 0.058). Hence, listening with MT significantly improved the

reading comprehension which conforms to the simple view of Gough and Tunmer (1986). Specific activities with listening MT words and reading comprehension correlations are presented in Table 3.

Moreover, the use-of- imagination strategy shows significant positive correlation with the comprehension skill of primary graders (R = 0.327, p-value = 0.077). This implies that pupils' comprehension skill may be improved with a more frequent use of imagination in performing assigned task. However, this practice is not widely used among primary graders.

Finally, the use of teacher-made IMs shows significant positive correlation with listening skills (R = 0.389, p-value = 0.034); that is, teachers who are more engaged with IMs-making are most likely developing pupils with better listening skill.

The extent of reading Visayan short stories has significant correlation with the reading proficiency indicators of the learners – reading fluency (R = 0.495, p-value = 0.005), listening skills (R = 0.362, p-value = 0.049) and comprehension skills (R = 0.401, p-value = 0.028) (Table 2). That is, primary grade learners who got high scores in reading fluency, listening skills and comprehension skills were pupils of the primary teachers who had employed reading Visayan short stories in their classes to a high extent.

The foregoing results indicate that development of the reading proficiency among primary grade learners is significantly influenced by strategy of reading Visayan short stories. Accordingly, teacher participants that confirmed effectiveness of Visayan stories said that "*mas dali man nila masabtan ang estorya.*" (Children can easily comprehend [lesson] through story.) It should be noted, however, that teacher participants were constrained with limited resources and materials for Visayan stories as contained in the following comments "*... mag-pangita pamig storya nga bisaya kay kulang ang materials.*" (We still have to look for Visayan short stories due to lack of materials.) The lack of proficiency in fluency of reading can be accounted to the deficiency of materials for Visayan stories. Improving materials acquisition and widespread implementation of reading Visayan stories will consequently increase or improve reading proficiency in MT.

Table 2 further shows that reading big books and small books shows significant correlation with the reading proficiency, particularly, reading fluency (R = 0.378, p-value = 0.039) and listening skills (R = 0.439, p-value = 0.015). In spite with the issues on the problem of lack of materials, still the teachers found ways to implement MTB-MLE with less material resources; that is, optimizing learning experience through listening activities and oral reading. Children benefit from conversations that include varied vocabulary that use open-ended questions and that are rich in explanatory talk (Dickinson & Tabors, 2001).

MTBI practice in listening with MT words shows significant correlation with the comprehension skills (R = 0.349, p-value = 0.058) of primary graders. Nonetheless, listening news from local radio station has significant correlation with the listening skills (R = 0.501, p-value = 0.005) and comprehension skills (R = 0.460, p-value = 0.011) (Table 3). This simply means that it is more easy for teachers to enhance learners' listening skills through exposing them to a news from the radio other than that the giving of assignments. One of the teachers confirmed this saying, "I give them assignments to listen to the news."

Despite the positive responses of the concerned teachers on the MTB-MLE, early implementation of the curriculum still bears the traditional practices of the teachers. According to Carbo (1986), a number of educators in the early 1970's believed that poor readers had perceptual disorders which had to be remedied before any real reading progress could occur. Instead, much time was being spent in classrooms with children simply copying from textbooks or written notes in the blackboard, with little comprehension of the real meaning, or the ability to apply their learning to other circumstances (Boud, Keogh & Walker, 2013). As a result, there is poor achievements from students who felt even more unsuccessful because their learning style weaknesses were the focus of so much attention and concern. Not surprisingly, most attempts remediate perceptual deficits were largely ineffective, and did not result in academic gains.

It is therefore a must for teachers to strengthen each child's learning experience through a variety of songs, stories, games, and activities. However, children acquire these skills in an overlapping sequence rather than by mastering one level before the next (Dickinson & Neuman, 2006). Learning materials developed contextually tend to promote authentic language learning and higher order thinking and reinforce learning across the curriculum, especially for those learning a language as both a target language and a medium of instruction (Krashen, 1981). In addition, through content studies with the classroom observation, the textbook

offered technical skill approach literacy and language learning has made a very little use of the children's funds of knowledge. Hence, teachers should be exposed to the use of interactive writing and read-aloud to develop children's' print knowledge-left-to-right directionality. Knowledge of print concepts is developed through direct contact with books and explicit modeling by skilled readers as well as through exposure to environmental print (Adams, 1990). As for application during planned read-aloud, for example, teachers must emphasize vocabulary words and discuss a book character's thinking, feelings, and actions. Further, teachers must explicitly teach vocabulary in an integrated, meaningful way and in the context of everyday experiences. Children learn the meaning of most words indirectly, through everyday experiences with oral and written language (Parker, et al., 2000).

5 Conclusions

The change in the landscape of educational system towards K-12 curriculum has propelled primary grade teachers to innovate strategies in the implementation of mother-tongue based multilingual education (MTB-MLE). In the case of East 1 Butuan District, Caraga, Philippines, the best MTBI practices include the practice of reading MT words, practice of listening with MT words, use-of-imagination strategy and use of teacher-made instructional materials in the development of primary learners' reading proficiency in mother tongue. These strategies are intertwined in addressing the reading needs of the learners as they significantly determine specific dimensions of language literacy either using the additive bilingualism or the subtractive bilingualism. Moreover, positive thoughts for changes, expectancies and values from mother tongue based curriculum are essentials that teachers pursue to discover and innovate resources and strategies; hence, enriching the language proficiency of the small children for future challenges in life.

To improve the reading fluency, some best practices that may be employed are reading Visayan short stories and small book and big books in mother tongue. Reading Visayan stories and small/big books, listening with Visayan news and use of teacher-made instructional materials will increase listening skills of primary learners. On the other hand, comprehension skill is also developed in reading and listening Visayan stories, listening news from local station and use of imagination. All of these strategies are used to promote oral language and vocabulary development, which covers informal conversations, songs, rhymes, finger plays, movement activities, play, read-aloud and storytelling. Apparently, understanding and appreciation of one's culture will inspire learners to read – not just to understand the context but to express one's self. Hence, developing the language literacy of the small children will be made successful through their social and emotional learning experiences – in games, stories and songs written in mother tongue.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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The Efficacy of the Strategic Intervention Materials (SIM) to the Achievement in Physics of a Selected Group of Public School Students in Las Nieves, Agusan del Norte

Fernando T. Herrera[1,2,*] *& Abraham T. Soriano*[1]
[1]College of Education, Caraga State University; Ampayon, Butuan City 8600, Philippines
[2]College of Arts and Sciences, Caraga State University; Ampayon, Butuan City 8600, Philippines

ABSTRACT

The main purpose of the study was to determine the efficacy of Strategic Intervention Materials (SIM) to the achievement in Physics of a selected group of fourth year public school students in Mat-i, Las Nieves, Agusan del Norte. It is a pretest-posttest quasi-experimental method that aimed to determine the least-learned competence and performance of the fourth year pupils in Physics before and after utilization of the SIM. The study used the ADDIE model which consisted the five (5) phases namely: Analysis, Design, Development, Implementation and Evaluation. The SIMs that were utilized by the selected group of students followed careful planning and formulation and were validated and assessed by credible evaluators and students themselves. The substantial contents of the said materials were based on least-learned or least-mastered concepts or areas among the suggested ten (10) core topics in Physics. Results of the study revealed that the utilization of the SIMs were effective in improving the least-learned competence of the learners in Physics as evidenced by its significant increase in their posttest scores. Moreover, the increase in the performance in physics is highly determined by the introduction of SIM in the class and not by the remediation in mathematics.

Keywords: achievement, efficacy, strategic intervention materials

1 Introduction

It is well established that education is a force for empowerment. It is the most effective cutting-edge tool against the forces of poverty. It is sad to note, however, that over the last six years, there has been a decline in the quality of Philippine education, especially at the elementary and secondary levels. Yet, education has become the ultimate ladder of opportunity—for both individuals and for countries in general. It is pointed out that our country must face up to the burden of adequately educating all young people—because quality basic education is imperative for a successful transition to the knowledge society. The progress of one nation lies on the quality of education, thus, with more and better educated people, a country would have a greater chance of economic development (Soberano, 2009). Accordingly, the amount of knowledge that the student

*Corresponding Author
*E-mail: fernan_herrera@yahoo.com

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learned is a criterion and goal of effective teaching.' It is not the only principle of teaching that matters but the selection of instructional materials that meet the needs of students, and what the teacher imparts in the classroom, are several other factors that can influence the students' development in learning (Ding, 2006).

However, with the problems persisting today in Philippine education system, the Filipino's standpoint for functional literacy to empower learners is at stake. The scarcity of teachers, poor classrooms and dearth of instructional materials, low student achievement and increasing number of out-of-school children hamper many learners to be active makers of meaningful life. While all curriculum areas share some of the same issues and concerns, individual curriculum areas seem to also have concerns specific to them and their courses. This list looks at the top ten concerns for math teachers. Math curriculum often builds on information learned in previous years. If a student does not have the required prerequisite knowledge, then a math teacher is left with the choice of either remediation or forging ahead and covering material the student might not understand. Consumer math is easily connected to daily life. However, it can often be hard for students to see the connection between their lives and geometry, trigonometry, and even basic algebra. When students do not see why they have to learn a topic, this impacts their motivation and retention. Unlike courses where students have to write essays or create detailed reports, math is often reduced to solving problems. It can be difficult for a math teacher to determine if students are cheating. Typically, math teachers use wrong answers and incorrect solving methods to determine if students did, in fact, cheat. Some students have come to believe over time that they are "just not good at math." This type of attitude can result in students not even trying to learn certain topics. Fighting this self-esteem related issue can be difficult indeed. The teaching of mathematics does not lend itself to a great amount of varied instruction. While teachers can have students present material, work in small groups for certain topics, and create multimedia projects dealing with math, the norm of a math classroom is direct instruction followed by a period of solving problems. When a student misses a math class at key instructional points, it can be difficult for them to catch up. For example, if a student is absent on the first few days when a new topic is being discussed and explained, a teacher will be faced with the issue of helping that student learn the material on their own. Math teachers often have classes with students of varying ability levels within the same classroom. This might result from gaps in prerequisite knowledge or each student's feelings towards their own ability to learn math. Teachers must decide how to meet the needs of the individual students in their classrooms.

The current state of science education in the Philippines, particularly in the basic education level, lags behind other countries in the world. As mentioned by Orleans (2007, p 33-34):

> The results of the Second International Science Study (SISS) and Third International Mathematics and Science Study (TIMSS) placed the Philippines in disadvantaged positions among participating nations. In the SISS, the Philippines ranked almost at the bottom of the list of seventeen (17) nations which took part in this large-scale evaluation of educational achievement. Similar outcomes were revealed in the 1995, 1999 and 2003 TIMSS. In the different science subject areas, achievements in physics of Filipino students appeared below the international standards. The Philippines ranked third and fourth to the last in the list of nations in the 1999 and 2003 TIMSS respectively. Findings of Philippine based studies also present the same conclusion of low student achievement in physics.

Some others noted:

> Among all the subjects being taught in elementary and high school, science is the most logical anchor for environmental education. And in this larger area, Philippine education has suffered. This is the reason why environmental education is deficient – its very anchor which is science is weak. Addressing the deficiencies in science education particularly those related to environmental education, will significantly help solve the problem. The National Achievement Tests show that aside from Mathematics, Science continues to be the most difficult field of study in basic education in the Philippines. In the 1999-2000 National Elementary Achievement Test (NEAT), Filipino pupils gave correct answers to less than 50% of the questions in Science (48.61%). This score has not improved in recent years. In comparison to our science syllabus, there are fewer topics in the science syllabi of other countries with high achievement scores in the Third International

> Mathematics and Science Study (TIMSS). Here, we have ranked consistently ranked among the lowest in the past years. The Philippines has not participated in the TIMSS since 2007. The main factors that account for the low performance in science of the Filipino students include the lack of support for a scientific culture reflected in the deficiencies regarding the school curriculum, the inadequate teaching learning process, insufficient instructional materials and lack of teacher training. For instance, the lack of good and engaging textbooks and lack of science equipment have hindered the conduct of scientific investigations and hands-on activities among Filipino pupils. (Inspire & Fascinate with Science, n.d., pp. 5-7)

In Mat-i National High School, the results of National Career Assessment Examination (NCAE) way back from 2006 showed low performances in the science subject. Never been in the fifteen years history of the school that the top five (5) slots in division-sponsored academic contests were won by its students despite the intentional efforts practiced by concerned teachers. By careful self-evaluation, the researcher, who happened to be the subject teacher realized that it could have been due to the traditional and commonly practiced teaching approaches, methods or styles that the teacher applied. This school year, the teachers are challenged to upgrade the educational resources of the school to improve the academic performance of the students and update the teaching and learning system towards bolstering better achievements.

The Strategic Intervention Materials (SIM) were designed to help teachers provide the students a needed support to make progress. These increased and deepened their skills, knowledge and understanding from concrete science to what is more abstract. The materials provided the students the opportunity to explore their understanding and make sense of these new scientific ideas. These helped the students talked what they knew and understood from the teacher how to formalize their thinking. Furthermore, these were instructional materials meant to re-teach and to help the learners master a competency-based concept(s) and skill(s) which they were not able to develop during regular classroom teaching.

Each intervention material has five parts such as the guide card, activity card, assessment card, enrichment card and reference card. The guide card stimulates the students' interest on the topic to be discussed and give a preview of what they will learn. It presents the skill focus that mentioned the learning competency, the three subtasks or activities and the concrete outcome or product students are expected to demonstrate or produce. This cites the activities and challenge the learner in performing the tasks which are competency-oriented and can be done individually or per group. The activity card follows the guide card where it translated the focus skills in at least three activities. It provides activities that will be organized based on the sequence of the focus skills written in the guide card and included examples to concretize the concepts, particularly those drawn from real life experiences. The activities to be included in the activity card allow students to make discoveries and formulate ideas on their own, guide and challenge their thinking and learning and use local data and situations like interacting with people in the community. It also provides transition statements that reorganize students' accomplishments. Likewise, the intervention materials provide questions that guide students to develop concepts and focus skills, elicit the message or meaning that a student can take away from an activity and establishes the relationship between the topics/lessons and what students already know or are familiar to them. The assessment card provides exercises, drills or activities that allows students to assess their understanding of what they have learned correct errors when appropriate and monitor their learning and use feedback about their progress. This card will be formulated in standard test formats to give students practice in test taking techniques. It therefore has a separate card that includes the answer key. The enrichment card provides activities that reinforced the content of the lesson and provides opportunities for students to apply what they have learned to other subject areas or in new contexts. It also encourages students to work independently or in a group to explore answers to their own questions. The reference card provides reading to students. It relates the content with the students' life experiences. It includes a carefully and well-researched list of resources that helps students reinforce concepts and skills that they learned. It also includes additional useful content not found in the books.

In a nutshell, the strategic intervention materials ensured alignment of activities with the tasks/objectives, kept the activities short and simple, provide a variety of activities to cater to the diverse learning styles;

provided number of activities so that the learner can have enough practice in developing the skill and lastly focused on the least-mastered skills or concepts.

It is on these grounds that a great hope to make some sense to do something to change for the better. It is for this reason that the researcher embarks on developing strategic intervention materials in physics so as to enhance learning and remedy the least learned or mastered skills of the students.

2 Theoretical/Conceptual Framework

This study is anchored on the "Cognitive Theory" of Piaget (1980) which states that children proceed through four distinct stages of cognitive development: the sensory motor stage, the preoperational stage, the concrete-operational stage and the formal-operational stage. Those at the age of 12 and above children attain the formal-operational stage when they can apply their current thinking processes to new experiences. They gradually modify these processes to better accommodate reality. This describes cognitive growth as the gradual acquisition of high speed information through sophisticated strategies for developing, organizing and accumulating information.

This is well supported by the Theory of Mental Conditioning by Pavlov and Gantt (1941) that learning is conditioned by the attitude of the learner, the environmental conditions conducive to learning and the attitude and skill of the teacher in setting the stage for learning. The skill of the teacher in teaching is a good motivation to the children and is closely related to readiness. Learning is conditioned by the child's readiness to learn. It is the job of the teacher to provide skilled opportunity and management of the transfer of learning.

Dewey (1938) pointed out that it is vitally important that education should not be the teaching of mere clear facts, but the skills and knowledge which students learn be integrated, fully into their lives as persons, citizens and human being. This practical element – Learning by Doing. Bruner (2000) supports that learning is an active process in which learners construct new ideas or concepts based upon their current/post knowledge. According to the principle of Social cognitive Theory, learners learn not only through their own experiences but also by watching others.

Bruner (2000) emphasizes the theory of discovery learning that individual learns from his/her own discovery of the environment. Learners are inherently curious, thus they can be self-motivated until they find an answers to the problem. Learners, when actively involved in their own learning, will continuously construct their own knowledge. Each individual is capable of learning how to learn. Bruner's idea gives rise to the emerging theory of constructivism and self-learning.

Based on Vygotzky's (1992) theory of constructivism, it explains that each student generates their own rules and mental models which they use to make sense of their experiences. This theory also suggests that learners construct knowledge out of their experiences. However, constructivism is often associated with pedagogic approaches that promote active learning or learning by doing. By reflecting on the learners experiences, learners construct their own understanding of the world they live in. However, according to Miller and Dollard (1941), imitative learning is simply a special case of instrumental conditioning. see nothing unusual or special about imitation learning. For them the role of the model is to guide the observers' responses until the appropriate one has been made or to demonstrate to an observer with responses would be reinforced in a given situation. Social constructivism emphasizes the importance of the learners being actively involved in the learning process, unlike previous educational viewpoints where the responsibility vested with instructors to teach and where the learners played a passive receptive role. This is an effort to show that the construction of knowledge is governed by social, historical and cultural context. In effect, this is to say that Learner who interprets knowledge has a predetermined point of view according to the social perspectives of the community or society they live in.

Glasersfeld (1989) advocated that learners construct their own understanding and that they do not simply mirror and reflect what they read. Learners look for meaning and will try to find regularity and order in the event of the world even in the absence of full or complete in formations.

Stone (1996) affirmed that the generative instructions help students to construct their own educational goals and experiences as well as the knowledge. With this approach, information is prescribed on the

schedule determined by students' interests and goals. Learning is assumed to be socially constructed out of the interactions between the students' innate tendencies and predisposition and the social context in which the students live. The psychologist Vygotzky stresses that learning is affected by social influences; therefore he suggested the interactive process in learning.

Ormrod (2000) expressed that one specific strategy that can help to develop conceptual understanding in the learners is by using authentic activities in which the teacher must have to incorporate their lessons into real world activities. This was reinforced by Aristotle who said that "What we have to learn to do, we learn by doing". If learning is a personal process, then the students is in the best position to measure his/her progress against the benchmark.

3 Statement of the Problem

This study aimed to test the efficacy of a strategic intervention materials in physics to carry out the focal goal of the Bureau of Secondary Education in sustaining the educational needs of every Filipino student and to equip educators with the most updated and innovative teaching method.

Specifically, it attempts to answer the following questions:

1. What is the Mathematics competency level of the selected fourth year students of Mat-I National High School?
2. What is the level of prior knowledge of the selected group of students in the least -learned areas of Physics?
3. What is the level of post knowledge of the selected group of students in the SIM-applied areas of Physics?
4. Does the exposure to SIM significantly improve the competency of the students in Physics with respect to the least-learned areas?
5. Is there a significant relationship between the student's level of competence in mathematics and their performance in Physics?
6. Does the performance of the students in mathematics have contamination effect in their performance in physics?

3.1 Null Hypotheses

This research developed the following null hypothesis being tested at 0.02 level:

H_{01}: There is no significant improvement in the competency in Physics among students exposed to Strategic Intervention Material.

H_{02}: There is no significant relationship between the student's level of competence in mathematics and their performance in Physics.

4 Materials and Methods

The study is a pretest-posttest quasi-experimental design which adopted the ADDIE model (fig 1). This ADDIE model is the generic process traditionally used by training developers with five phases namely; Analysis phase, Design phase, Development phase, Implementation phase, and Evaluation phase. These represent a dynamic, flexible guideline for building effective training and performance support tools (Strickland, 2006). In analysis phase, the participants were given a pretest that determined the least-learned competencies in Physics and identified their existing knowledge and skills in solving the problem. In the design Phase, the researcher developed the Task Analysis Chart (TAC), Table of Specification (TOS) in constructing the test questionnaire, Item Analysis for content validity and computed the Mean Percent Score (MPS) in analyzing the least- learned competency. It answered the questions on how the experts and students assess the SIM along the following components: Guide Cards, Activity Cards, Assessment Cards, Enrichment Cards and Reference Cards. The development phase was where instructional designers created

and assembled the content assets that were blueprint in the design phase. In this phase, storyboards and graphics were designed. If e-learning was involved, programmers developed and /or integrated technologies. Meanwhile, in the implementation phase, the proposed SIMs were utilized by a pilot group of students who belonged to the upper group of students in the Mathematics Screening Test.

Fourth year students with lowest performance level in the pretest were given the developed SIM within the forty (40) days. The students were guided on how to use the said material. And finally, in the evaluation phase, the participants were given the posttest that determined their achievement level or improvement after using the SIM.

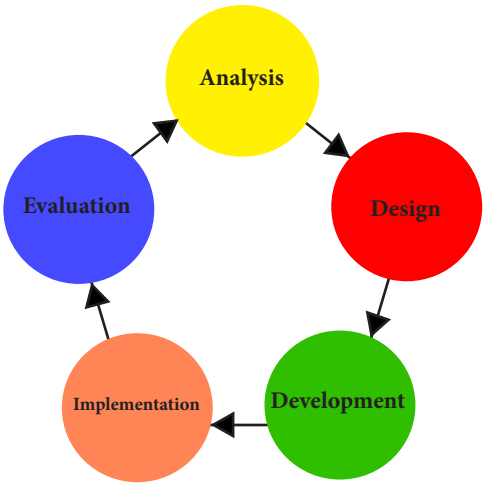

Fig 1. The five phases of the ADDIE Model

Fig 2. Steps in the Making of SIM

This research was conducted at Mat-i National High School, Mat-i, Las Nieves, Agusan del Norte. From the total population of 70 senior students, only 35 of them were noted with least-learned competences. Hence, they were the only students considered to participate in the study. The SIMs were constructed based on the topics found to be least-learned by the students. Reference materials from various sources were gathered, collected and utilized. Prior to the conduct of validity assessment, the draft was referred to teachers of the subject for comments and suggestions. Several revisions were done in reference with the comments and suggestions.

Sample of the proposed SIM draft were given to each expert for validation and evaluation together with the assessment instruments. For quantitative assessment, ratings of the experts was based on the following scales: SE – superior, HE – highly evident, ME – moderately evident, LE – less evident, and NE – not evident. Criteria in the instruments was adopted from the DepEd Criteria for National SIM Competition. A separate instrument was used for the qualitative assessment of the experts of the proposed SIM. The five (5) chosen experts that assessed the SIMs were the graduates of Instructional Materials and Facilities study, BS Physics graduates and with research inclination on inventions and construction of instructional materials in teaching Physics and the Division Education Program Supervisors in Science. This was done to ensure that the content and pedagogical characteristics of the SIM were reviewed and assessed by credible evaluators.

This study also utilized a validated researcher-made questionnaire comprising forty (40) items which was constructed Table of Specification was made to ensure that the content validity and the distribution of the competencies of the 40-item test was considered. The questionnaire included the competencies in selected physics concepts which were the basis for the development of Strategic Intervention Materials in Physics using the ADDIE Model. The researcher-made test was designed to measure the mastery level of the students

on the lessons chosen by the researcher and as suggested the Education Program Supervisors. Its validity and reliability were taken by subjecting it to parallel pilot testing to other students in Physics class and statistical analysis for internal consistency ($\alpha = 0.956$).

The items in the test were analyzed and the difficulty/discrimination indices were taken to discard or reject the item. Items which were not within the range of 0.20 to 0.80 difficulty index and 0.30 to 0.80 discrimination index were discarded and items which fell within the prescribed limit were retained. Furthermore, the validated test were finalized and a pilot pretest was administered to other groups of respondents before the SIM Teaching was started. The selected group of student who belonged to the lower fifty (50%) of Mathematics Screening Test were exposed to the SIM Teaching within a certain period. Pretests and posttests of the same content were administered given to the selected group of fourth year students

For the analysis of the data, the percentage and mode, the mean, percentage and the t-test were used employing the 0.02 level of significance. The percentage and mode were used to describe the overall assessment of the SIM. For the specific indicators and cards, the mean was used to determine the extent of evidence shown in the SIM. The verbal description for assessment was based on the following table.

Table 1
Mean Interval for Interpretation

Mean interval	Rating Extent	Response	Overall Rating
4.6 – 5.0	5	SE	Outstanding (O)
3.6 – 4.5	4	HE	Very Satisfactory (VS)
2.6 – 3.5	3	ME	Satisfactory (S)
1.6 – 2.5	2	LE	Poor (P)
1.0 – 1.5	1	NE	Very Poor (VP)

In the final phase of the study, ten (10) students were chosen from among the low performers identified in the assessment of the first phase of the study to assess the utilized SIMs. For quantitative assessment, ratings of the students based on the following scales: SE – superior, HE – highly evident, ME – moderately evident, LE – less evident, and NE – not evident are similar to the experts' instrument but they slightly vary in the specific criterion to fit to the students' understanding. The said criteria contained the following entries: Content of the SIM (whether the content is relevant to bring out the objectives of the entire SIM); Illustrations (whether the diagrams are attractive and helped capture students' attention); Learning Tasks (whether the tasks are motivating, interesting, challenging and easy to do); Applications (whether the questions and instructions are understandable to the level of the students); and Evaluation, and Instructional Approach (whether the material fits to the level of thinking of the learners). Mean percent scores were obtained to determine the achievement of the pilot group in the test given in the assessment cards of the proposed SIM and the difference was analyzed using the t-test for independent samples.

5 Results and Discussion

Table 2 presents the level of competence of the fourth year high school students in mathematics. Data reveal that students only mastered among the 15 Mathematics areas the "Basic Operations with Integers" topic with a mean percent score of 75%. As indicated, the selected group of fourth year students were found to be least-mastered in the rest of the 15 topics except in "Pythagorean Theorem" where they were unmastered. The overall MPS of the selected group of students was only 19.95% which showed least mastery level which also meant that they have low or weak knowledge competence in Mathematics. These students were regularly taught in the classroom of the 10 physics core topics or areas presuming they were the slow learners in the subject.

Table 2
Level of Competence of the Fourth Year High School Students in Math

Areas	Ave. Score (HPS:45)	Mean Percent Score	Level of Competence
Basic Operation with Integers	33.75	75	Mastered
Basic Operation with Fraction	7.75	17.22	Least Mastered
Basic Operation with Decimals	17.75	39.44	Least Mastered
Basic Operation with Exponents	2.5	5.55	Least Mastered
Order of Operation	13	28.88	Least Mastered
Rounding Off Numbers	6	13.33	Least Mastered
Determining Significant Figures	9.5	21.11	Least Mastered
Converting Decimals to Scientific Notation	9	20	Least Mastered
Transforming Scientific Notation to Decimals	9.25	20.55	Least Mastered
Conversion of Units	2.31	5.13	Least Mastered
Percentage	9	20	Least Mastered
Operation with Monomials	2	4.44	Least Mastered
Evaluating Algebraic Expression	1	2.22	Least Mastered
Pythagorean Theorem	0	0	Unmastered
Averaging	12	26.67	Least Mastered
Overall	**8.98**	**19.95**	**Least Mastered**

Among the ten (10) core topics or areas of Physics, four turned out to be least-learned as indicated by their mean percent scores. These are acceleration (kinematics), momentum, work and electromagnetic waves with an MPS of 36%, 35.62%, 25%, and 42.5%, respectively. It only showed that the competency levels of the selected fourth year students of Mat-I NHS were low or weak and have not reached or surpassed the 75% passing qualification. The overall knowledge level of the students was only in the near mastery level (51.65%) which meant that they were to be subjected for SIM. SIM construction was then started focusing on the least-learned or least-mastered skills or concepts. It is to be noted that the researcher was able to develop only the SIM on Acceleration (SIM-1) due to time constraints.

After application of Strategic Intervention Materials to the identified least-learned topics or areas during the SIM Teaching and Utilization, the competency levels of the students manifested a clear increase in terms of its mean percent scores. As indicated in Table 3, Acceleration was 80.50, Momentum was 71.88, Work was 70.00, and Electromagnetic Waves was 85.83 with the knowledge levels of mastery, near mastery, near mastery and mastery, respectively. The overall knowledge of the students was already in the mastery level (75.00%) which only mean that the SIMs were truly effective that brought about the improvement of the knowledge levels of the students in all the identified least-learned concepts or areas in Physics.

Same with the study of Soberano (2009, p8, pp2):

> The researcher's findings agreed with the the findings of Hogan (2000) and Woodward (2004), who found out that intervention materials contributed to better learning of the concepts among students. Posttests and maintenance tests indicated that students who were taught with material employing the causal style of discourse had significantly better retention of facts and concepts and were superior in applying this knowledge in problem-solving exercises. Furthermore, the study supports the findings of Johnson (1994) which claims that Cooperative learning helps students achieve in the areas of long-term retention of material, intrinsic motivation, higher-level reasoning, academic and social support for all students, social development, and self-esteem. The findings are also consistent with the study of Anthony et.al (1998) who stated that students learn best when they can build on past

experience, relate what they are learning to things that are relevant to them, have direct "hands-on" experience, construct their own knowledge in collaboration with other students and faculty, and communicate their results effectively.

Table 3
Level of Prior vs Post Knowledge of the Fourth Year High School Students in the Areas of Physics

Areas		Ave. Score (HPS: 40)	Mean Percent Score	Level of Prior Knowledge
1. Measurements	Pre	25.8	64.5	Nearly Mastered
	Post	30.40	76.00	Mastered
2. Kinematics	Pre	22.27	55.67	Nearly Mastered
	Post	32.51	81.27	Mastered
2.1 Speed and Velocity	Pre	23	57.5	Nearly Mastered
	Post	33.00	82.50	Mastered
2.2 Distance	Pre	25	62.5	Nearly Mastered
	Post	31.50	78.75	Mastered
2.3 Acceleration	Pre	14.4	36	Least Mastered
	Post	**32.20**	**80.50**	**Mastered**
2.4 Free Falling Body	Pre	26.67	66.67	Nearly Mastered
	Post	33.33	83.32	Mastered
3. Force and Vector	Pre	24	60	Nearly Mastered
	Post	30.67	76.67	Mastered
4. Newton's Law of Motion	Pre	26	65	Nearly Mastered
	Post	32.33	80.83	Mastered
5. Momentum	Pre	14.25	35.62	Least Mastered
	Post	**28.75**	**71.88**	**Nearly Mastered**
6. Potential Energy	Pre	21	52.5	Nearly Mastered
	Post	27.00	67.50	Nearly Mastered
7. Kinetic Energy	Pre	22.5	56.25	Nearly Mastered
	Post	29.50	73.75	Nearly Mastered
8. Work	Pre	10	25	Least Mastered
	Post	**28.00**	**70.00**	**Nearly Mastered**
9. Power	Pre	24	60	Nearly Mastered
	Post	26.00	65.00	Nearly Mastered
10. Electromagnetic Waves	Pre	17	42.5	Least Mastered
	Post	**34.33**	**85.83**	**Mastered**
Overall	**Pre**	**20.66**	**51.65**	Nearly Mastered
	Post	**30.00**	**75.00**	**Mastered**

Table 4 presents the results of t-test on students' pretest and posttest scores in Physics.

Table 4

Results of the T-test on the Students' Pretest and Posttest Scores with Respect to the Ten Areas in Physics

Areas	Prior Knowledge (MPS)	Post Knowledge (MPS)	Difference	t-stat	Prob	Decision
1. Measurements	64.5	76	11.5	4.23	0.013	Reject H_o
2. Kinematics	55.67	81.27	25.6	6.44	0.000	Reject H_o
2.1 Speed and Velocity	57.5	82.50	25	6.37	0.000	Reject H_o
2.2 Distance	62.5	78.75	16.25	5.56	0.005	Reject H_o
2.3 Acceleration	36	80.5	44.5	10.23	0.000	Reject H_o
2.4 Free Falling Body	66.67	83.32	16.65	5.89	0.004	Reject H_o
3. Force and Vector	60	76.67	16.67	5.93	0.003	Reject H_o
4. Newton's Law of Motion	65	80.83	15.83	4.88	0.012	Reject H_o
5. Momentum	35.62	71.88	36.26	7.78	0.000	Reject H_o
6. Potential Energy	52.5	67.5	15	4.56	0.032	Reject H_o
7. Kinetic Energy	56.25	73.75	17.5	6.14	0.001	Reject H_o
8. Work	25	70	45	11.34	0.000	Reject H_o
9. Power	60	65	5	1.10	0.218	Accept H_o
10. Electromagnetic Waves	42.5	85.83	43.33	9.22	0.000	Reject H_o

As indicated in the Table 4, the decisions rejecting Ho were implications that significant improvement took place in the performance of the students in the specific area or topic. It showcased that there were really significant improvement in all the identified least-learned concepts or areas. It was just a proof that the developed and utilized SIMs were effective. The acceptance of Ho as in the case of "power" signified that improvement in the scores is not significant (although there was an increase where only a difference of 5 was noted).

Before the SIMs was introduced to the class, the performance of the students was poor and fair in mathematics and physics, respectively. Analysis showed that the positive correlation between the pretest scores in mathematics and physics is significant at $\alpha = 10\%$. This implies that students who have low scores in mathematics most likely have low scores in physics; that is, the performance of students in mathematics determined their performance in physics prior to the intervention.

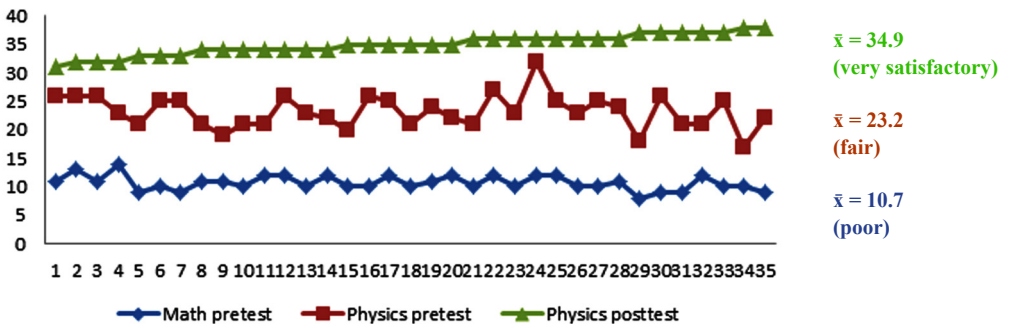

Fig 3. Correlation Analysis of the Pretest Scores in Mathematics, and Pretest and Posttest in Physics

Table 5
Correlation Analysis of the Pretest Scores in Mathematics, and Pretest and Posttest in Physics

Variables correlated	R-coefficient	Prob.	Decision
Pretest in Math & Pretest in Physics	0.328	0.055	Significant
Pretest in Math & Posttest in Physics	-0.382	0.023	Significant
Pretest in Physics & Posttest in Physics	-0.216	0.214	Not significant
Pretest in Physics & Posttest in Physics Controlling: Pretest in Math	-0.104	0.560	Not significant

After the introduction of SIM, the physics performance improved to 'very satisfactory.' Remarkably, the correlation (Table 5) between the students' performance in the mathematics and physics is significant at α = 5% but negative. This implies that students who got low scores in mathematics in the pretest (consequently low scores in physics pretest) obtained high scores in the posttest in physics. Analysis further showed that the correlation between the students' pretest scores in Physics and their posttest scores in Physics is not significant; that is, pretest performance does not determine the posttest performance in Physics. On the other hand, relationship between pretest and posttest in physics remains not significant despite controlling of the pretest in Mathematics. These results imply that the increase in the performance in physics is highly determined by the introduction of SIM in the class and not by the remediation in mathematics.

6 Conclusion

Based on the analysis, results of the study revealed that students' foundation in the basic operations of mathematics particularly in the application of Phytagorean Theorem is very weak. On the other hand, the exhibited scores of the students in Physics prior to the use of the SIM showed that students do not have enough background in the ten areas of Physics particularly in the following topics: acceleration, momentum, work and electromagnetic. It was also observed that significant increase in the scores of the students in Physics was observed. Students have relatively improved their performance or competence after they have been exposed to SIM. Students' exposure to SIM has a significant contribution to improving the least – learned competence of the students in the subject .

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Mathematical Foundations and Board Examinations Performance: A Case of Caraga State University

Marvin H. Siega[1,+], *Marjun C. Abear*[1,#] & *Rosie C. Lopez-Conde*[2,*]
[1]Department of Education - Butuan City Division
[2]College of Education, Caraga State University; now at
Philippine Normal University- Manila, Taft Ave, Manila 1000, Philippines

ABSTRACT

This study analyzed the relationship between mathematical foundations (level of mathematics taken, General Point Average (GPA) in all mathematics subjects, total number of units of mathematics subjects earned, college/advance algebra taken and its corresponding total units obtained) and the board examination performance among the graduates of selected programs of Caraga State University-Butuan City from SY 2005 to 2012. The study used logistic regression analysis and odds-ratio test to analyze the cross-sectional data gathered. Stratified random sampling in the selection of board examination takers, which includes the graduates of Bachelor of Science in Agricultural Engineering, Bachelor of Science in Geodetic Engineering, Bachelor of Science in Electronics and Communication Engineering, Bachelor of Science in Forestry, and Bachelor of Secondary Education major in Mathematics was employed. Results of the study revealed that mathematical foundations of the respondents are directly linked with the board examination performance as evidenced by the p-value (< 0.05) which is significant at 0.05 level. Therefore, mathematical foundations such as university level mathematics courses and GPA in mathematics have impacts to the board examinations performance.

Keywords: Board Examinations, Mathematical Foundations, Odds Ratio

1 Introduction

Board examination performance of the graduates has always been a significant factor to all the universities and colleges around the globe. It has been the primary hook of all the faculties as well as the administration to evaluate the overall performance of the school as well. In this study, the concern of which is focused on the predictors of the board examination that directly underscore the mathematical foundations. For many times, mathematical foundations have been observed to have a big impact in terms of the board examination of the graduates in their past records and board examinations. It is in the light of this reason that the researchers

*Corresponding Author
*E-mail: conde.rl@pnu.edu.ph [+]marvinjaysiega@gmail.com [#]marjun.abear@deped.gov.ph

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studied the relationship of the mathematical foundations and the board examination of the graduates from selected programs to determine the significance of this factor and the impact that it gave to the performance of the graduates in their respective board examinations.

Mathematics plays a vital role in the modernization of this civilization. It is everywhere and affects the everyday lives of people. Although it is abstract and theoretical knowledge, it emerges from the real world. Mathematics is one of the essential and basic areas of the college curriculum which has a wide field of subject matter. In education, mathematics plays an important role. It is the study of numbers, the relationship between these number and various operations performed on them that may lead to the development of higher order thinking skills. It is the science of quantity, size and shape. It is also a way to communicate and analyze ideas, a tool for organizing and interpreting data and above all, perhaps a method of logical reasoning unique to man. Mathematics is a necessary part of other sciences. Mathematics supports decision making in all aspects of life. Moreover, our society places a high economic value on mathematical literacy. Mathematical literacy is increasingly an imperative for employment. Mathematics has always been considered as one of the essential skills that students need to successfully complete a college education (Lee & Lee, 2009).

National Council of Teachers of Mathematics (NCTM/NAEYC Joint Position Statement, 2010) affirmed also that "in the changing world, those who understand and can do mathematics have significant opportunities and options for shaping their future". Thus, the statement says that in this modernized world mathematical foundation plays an important role in the success of an individual. They further stated that many adults in the US need to improve their basic mathematics skills for the success in postsecondary education and employment.

The licensure examination performance of Caraga State University-Butuan has been consistently high in some degree programs but lower in other programs. In order to understand the underlying factors of board examinations with mathematics, thus this study was conducted. This study hoped to help the administration in planning the curriculum in order to help students perform their best and be prepared for their career. It will also help teachers assess the students on the level of competency and mathematics proficiency to comply the requirements in preparation for the board examinations.

Some studies have indicated that performance of examinees in the Licensure Examination is shaped both by personal and educational factors. These were used as practical framework of the study. Several studies conducted have shown that academic performance in terms of Specialization (Computer Education, English, Filipino, Mathematics, Science and Social Studies), General Education (Social Sciences, Mathematics, Science, Filipino and English) and Professional Education serve as the strong predictor of Board Examination Performance (Pachejo & Allaga, 2013).

Several studies show the importance of mathematical foundation towards the success of an individual. Thus, the researchers envision in assessing the mathematical foundation among selected programs in selected programs in Caraga State University, Butuan City towards the performance in the licensure examination. Furthermore, this study aimed to assess the intensity of the behavior of the different factors such as: level of mathematics taken, percentage level of the graduates in terms of the GPA in mathematics, units of mathematics earned and the relation of algebra also with regards to their performance that goes behind the results of the different licensure examinations of the respective programs. The main objective of this study was to determine the effect of the mathematical foundations among selected programs in Caraga State University as basis to the performance in the board examination result. Specifically, this study envisioned to answer the problem if there was a significant relationship between mathematical foundations and board examination performance of the graduates.

2 Materials and Methods

This study investigated the predictors of the board examinations which include the total units in mathematics, GPA in Mathematics, level of Mathematics taken (University) and the total units specifically in College/Advanced Algebra in relation to the performance of the board examination takers. The study used

logistic regression analysis and odds-ratio test to analyze the cross-sectional data gathered from the registrar with permission. Stratified random sampling was employed in selecting the board examination takers from selected programs as the participants. This study attempted to analyze the success of the graduates on the board examination among selected programs in Caraga State University on the basis of Mathematical Foundation. From the analysis of these data, possible suggestions were given for the development and success of graduates.

The respondents of the study were the graduates of Caraga State University on the following selected programs: Bachelor of Secondary Education major in Mathematics, Bachelor of Science in Electronics and Communications Engineering, Bachelor of Science Agricultural Engineering, Bachelor of Science in Geodetic Engineering and Bachelor of Science in Forestry; who at the same time takes the licensure examination on the school year 2005-2006, 2006-2007, 2008-2009, 2010-2011 and 2011-2012.

Table 1
Distribution of the Respondents

	Respondents					
	BS GE	BS Ag Eng	BS ECE	BSF	BSEd-Math	Total
Number of takers	49	15	10	64	68	206

Frequency and percentage was used to describe the profile on the degree program of the graduates as well as the year they graduated. The analysis of the study was limited to Logistic regression since the dependent variable is set to be dichotomous (pass or fail) with the independent variables which were also coded and treated as continuous and nominal variables. Chi-square was also used to analyze the independent variables; GPA in Mathematics, university level of Mathematics taken, total number of units earned in Mathematics and total number of units in College/Advanced Algebra subject in terms of Program, College and Year graduated.

3 Results and Discussions

Majority of the respondents were female (53%) and most of them graduated from the Bachelor of Science in Forestry (32%). In terms of the total units in College/Advanced Algebra, the data show a 0.285 level of significance implying no significant relationship towards the board examination result of the respondents. Based on the result, the study's main variables have significant relationship in terms of the respondents Program and College with a significant value greater than the 0.05. In general, the results revealed that the GPA in mathematics has a significant relationship towards the success in the board examination with a 0.007 level of significance.

Table 2
Analysis of the Data in terms of Program and Mathematics Foundations using the Chi-Square test

Dependent variable	Independent variable	p-value	Decision	Conclusion
PROGRAM	Level Mathematics (University)	0.000	Reject H_0	Significant
	GPA in Mathematics Interval	0.002	Reject H_0	Significant
	Total No. of Units in Mathematics	0.003	Reject H_0	Significant
	Total No. of Units in College/ Advanced Algebra	0.003	Reject H_0	Significant

Tested at 0.05 level of significance.

Table 2 shows that all of the independent variables are significant to the dependent variable which is the program having a p-value less than the specified level of significance. This indicates that every independent

variable have a significant relationship on the program of the respondents. The significant relationship expresses an immense impact of the mathematics foundations to the performance of the graduates in their board examinations as it has a direct effect in the respective programs of the graduates.

Table 3

Analysis of the Data in terms of College and Mathematics Foundations using the Chi-Square test

Dependent variable	Independent variable	p-value	Decision	Conclusion
College	Level Mathematics (University)	0.000	Reject H_0	Significant
	GPA in Mathematics Interval	0.026	Reject H_0	Significant
	Total No. of Units in Mathematics	0.002	Reject H_0	Significant
	Total No. of Units in College/ Advanced Algebra	0.002	Reject H_0	Significant

Tested at 0.05 level of significance.

Table 3 shows that all of the independent variables are significant to the dependent variable which is the college having a p-value less than the specified value of the level of significance. This indicates that every independent variable have a significant relationship on the college of the respondents. It bears a greater effect on the graduates' proficiency in a better performance to their board examinations. It has significantly concluded that the mathematics foundation of the graduates in terms of the college they came from has affected their performance.

Table 4

Analysis of the Data in terms of the Board Examination Performance and Mathematics Foundations using the Logistic Regression Analysis test

Dependent Variable	Independent Variable	p-value	Decision	Conclusion	Odds Ratio
Board Examination Performance	Total Number of Units in Mathematics	0.328	Failed to reject H_0	Not Significant	1.220
	GPA in Mathematics Interval	0.007	Reject H_0	Significant	1.749
	Level of Mathematics Taken (University)	0.024	Reject H_0	Significant	0.058
	Total Number of Units in College/ Advanced Algebra	0.285	Failed to reject H_0	Not Significant	1.268

Hypotheses were tested at 0.05 level of significance.

In Table 4, the independent variables that have a significant relationship to the dependent variable are the GPA in Mathematics and the Level in Mathematics (University). Because of its probability values less than the specified level of significance which is 0.05. This means that, if the students who have good foundation or good grade in Mathematics subject, they are more likely successful in passing the board examination. Using the odds ratio result, with the odds value equal to 1.749, this imply that the odds of the respondents who got higher grade point average in mathematics subjects is more likely to pass than fail the board examination. Or in other words, 74.9% of the students are more likely to pass than fail the board examination, when they have good grades in mathematics subject.

This agrees with the result of the study of Lee & Lee (2009) where both engineering and business students show a significant association between grades in mathematics courses and success in the major, as well as general academic success. Accordingly, engineering and business students with advanced skills in mathematics would have a good chance at succeeding in college. It implies that mathematics can develop higher order thinking skills (Bialik & Kabbach, 2014) which is needed in the board examinations. Thinking critically, which is a form of higher order thinking in the board examinations will increase the chance to

pass the exam. Firdaus et al. (2015) pronounced that mathematics is one of the learning areas where critical thinking skills can be developed. Critical thinking skills can be developed through the process of mathematics learning because mathematics has a structure and a strong and clear connectivity between its concepts and the presence of complex mathematical tasks (Aizikovitsh & Amit, 2010).

The second independent variable that has a significant relationship of the board examination result is the Level of mathematics (University). The odds (0.058) of the students who took the mathematics in university level is less likely to pass than fail the board examination. The reason for this result is due to the content of the subject under in the university level. Since the board examination does not require higher knowledge in mathematics and it needs only the basic skills and analytical skills in solving word problems. Prior study of Lee, Brian and Lee, Jungsun (2009, p. 2) indicate that students' mathematical backgrounds positively influence their success in college. According to the study a student does not need University Level Mathematics to pass the board examinations. One of the reasons is because the board examination does not necessarily include higher level mathematics or the University Level Mathematics such as continuity & functions, discrete structures & logic, Euclidean and non-Euclidean geometry, probability, statistics application and the like but only on the basic skills and analytical skills in solving word problems. Needless to say that the board examinations given by the Philippine Regulatory Commission (PRC) does not require University Level Mathematics. Thus, in this case there is a need to look into the level of mathematics set as a minimum standard compared to the standard set by other countries.

Nonetheless, these studies do not clarify whether students' mathematical background represent their proficiency in mathematics, the level of commitment to academic performance, or the level of their intellectual capacity. The total units in mathematics and in College/Advanced Algebra do not significantly affect the performance of the board examination result. This means that even if the students have numerous number of units in mathematics and in College/Advanced Algebra, it does not assure that he/she pass the board examination.

The result implies that the GPA in Mathematics and the Level in Mathematics (University) has a greater impact on the graduates' knowledge of mathematics that can help them in their field of work. It has a direct effect on their performance in the board examination that contain mostly of mathematical questions and problems because having a good grade in mathematics and learning the university level mathematics manifest a good understanding of the related situations given in the board examination.

4 Conclusions and Recommendations

Mathematical Foundations such as University Level Mathematics courses and GPA in mathematics have impacts to the Board Examinations performance. Based on the findings of this study, if the students who have good foundation or good grade in Mathematics subject, they are more likely successful in passing the board examination.

It is recommended that the University may initiate activities and programs to enhance teaching and learning in mathematics. If possible, tutorial activities and enrichments may be in place to help students to cope up with mathematics difficulties. It is also possible to encourage students to only enroll University Level Mathematics, thus, opportunities to learn will be widened to possible exposure to these subjects.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Activity-based Teaching: Its Effects on the Student Performance in Economics Subject of Agusan National High School, Philippines

Gladys L. Lagura[1,+]
[1]College of Education, Caraga State University; Ampayon, Butuan City 8600, Philippines

ABSTRACT

This study was undertaken to determine the effects of activity-based teaching on the performance in economics of high school students of Agusan National High School. Specifically, this study sought to investigate the effects of activity-based teaching-learning modalities like the game show, quiz bee, talk show, drama and musikahan to the performance of the learners towards economics. There were 168 respondents selected through lottery method of the random sampling technique. The research instruments employed in the study consisted of two sets; the first set was the questionnaire for assessing student's interest, enthusiasm, learned lessons, activities, comprehensiveness, acceptability, and appropriateness of the strategies applied by the teacher, patterned after that of the Philippine Australia Project on Education Teaching Strategies. Pre-test and Post-test were also utilized to test the efficacy of the teaching-learning modalities and to measure the learning of the respondents. The respondents who were subjected to teaching-learning modalities like the game show, quiz bee, talk show, drama and musikahan were able to assess the extent of their satisfaction through the use of the instrument tool. The finding of the study revealed that game show, quiz bee, talk show, drama and musikahan are all very satisfactory as perceived by the respondents. Moreover, when respondents are subjected to different activity-based learning modalities, post-test results revealed that many of the students rose to excellent level as evidenced by the increased of total scores from pre-test to post-test. The data revealed that the respondents had gained knowledge and skills as shown by the increase of their scores from the pre-test to post-test.

Keywords: activity-based teaching, teaching-learning modalities

1 Introduction

The ultimate goal in any discipline is to effect a change in the learner's life. The search for effective and efficient methods of teaching has been a subject of research among many educators and researches. Although many research studies have shown that a learner's performance is a product of interrelated factors such as his mental ability, home and family background, school environment, and related others, some researches assert

*Corresponding Author
*E-mail: gladys.lagura@yahoo.com

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that teachers' method of teaching itself is one determinant of successful learning (Luna, 2000). And what each pupil/ student learns depends upon his own needs, interest, and problems.

In short, the content of knowledge is not an end in itself, but a means to an end (Tianero & Tianero, 2000). According to Heck (2009) that it has been proven that teachers have an important influence on students' academic achievement. They play a crucial role in educational attainment because the teacher is ultimately responsible for translating policy into action and principles based on practice during interaction with students. They stand in the interface of the transmission of knowledge, values, and skills in the learning process through the instructional strategies they employ in the classroom. Watson and Ecken (2003) stated that teachers prefer instructional strategies that make their work easier based on their belief, personal preferences, and norms of discipline. However, according to Kimani, Kara, and Njagi (2013), if the teachers' instructional strategies are ineffective, then the students will achieve inadequate progress academically. The level of achievement of students in school depends on the degree of effectiveness of instructional strategies used by the teacher.

One of the major issues and concerns encountered in the situation is the poor achievement of the learners. Many teachers struggle with motivating students to learn. This is especially prevalent in social studies classrooms in which students perceive social studies as boring (Schug, Todd, & Berry, 1984; Shaughnessy & Haladyana, 1985). Looking at the problems intervention is necessary to address the problems encountered in teaching social studies. Thus, this study is conceptualized to ascertain the effects of activity-based teaching-learning modalities that include the game show, quiz bee, talk show, drama and musikahan towards the student performance in Economics subject.

Teachers almost at all levels complain about the poor performance of students in their subjects. They complain that their students seem to lack interest in the subject especially those of Araling Panlipunan or Social Studies. The author or researcher of this study observes that most of her students find the subject boring and uninteresting. This is also supported by Schug et al. (1984), and Shaughnessy and Haladyana (1985) in their study students, perceive social studies as boring. The researcher wants to improve the performance of her students in economics where she is currently teaching. She believes that conducting activity-based study employing the experimentalist and pragmatist approach to teaching-learning may help remedy the problem of low performance.

2 Statement of the Problem

This study attempted to ascertain the effects of activity-based teaching-learning modalities in economics among respondents in Agusan National High School, Butuan City. Specifically, it sought answers to the following concerns:

1. what is the performance of respondents regarding Pre-Test and Post-Test scores in Economics when subjected to activity-based teaching-learning modalities?; and,
2. is there a significant relationship between activity-based teaching-learning modalities between the pre-test and post-test scores of respondents?

3 Theoretical Framework of the Study

This study is anchored on the theory of John Dewey about "learning by doing." Learning by doing makes learning easier as stated by Charles Peirce and William James (as cited by Tianero & Tianero, 2000). This is based on the philosophies of empiricism and pragmatism and modified by instrumentalism.

According to those who view knowledge as power, the fundamental purpose of education is to achieve knowledge. Teaching to achieve knowledge is essential if the teacher will make it possible for the student to discover the truth. In short, the subject matter is of value itself. It contains the body of knowledge that enables the student to discover the truth of his natural environment, and it provides the bases for the cultural and personal growth of the ideal person (Tianero & Tianero, 2000).

Instrumentalists, on the other hand, believe that knowledge is only a by-product of thinking. To them, the sole aim of education is to enable the student to know how to think. Thinking begins when an individual feels a problem. It is then that he formulates a plan of action or activities or ideas to determine what may solve the problem. Therefore, lessons should be designed to solve the problem through an activity.

In analyzing the nature of knowing, there are four types of propositions. Once clarified, these propositions provide us with an intelligent basis for examining the questions "can we know anything that can be said without the sense of experience"? This statement has been proven that a sense of experience through activity can be effective teaching-learning methodology. Most educators believe that learning by doing has 65 to 80% learning effectiveness. While the traditional lecture inputs method provide only about 25% learning of the total knowledge discussed by the teacher (Sevilla, et al., 1992).

According to Ayeni (2011), teaching is a process that involves bringing about desirable changes in learners so as to achieve specific outcomes. In order for the method used for teaching to be effective, Adunola (2011) maintains that teachers need to be conversant with numerous teaching strategies that take recognition of the magnitude of complexity of the concepts to be covered. Under the teacher-centered instructional strategies, students simply obtain information from the teacher without building their engagement level with the subject being taught. The approach is least practical, more theoretical and memorizing (Teo & Wong, 2000). It does not apply activity based learning to encourage students to learn real life problems based on applied knowledge. Since the teacher controls the transmission and sharing of knowledge, the lecturer may attempt to maximize the delivery of information while minimizing time and effort. As a result, both interest and understanding of students may get lost. To address such shortfalls, Zakaria, Chin, and Daud, (2010) specified that teaching should not merely focus on dispensing rules, definitions and procedures for students to memorize, but should also actively engage students as primary participants.

4 Methodology

This study used the descriptive and correlational method. The choice was based on the fact that this research undertaking was a fact-finding. It was an organized attempt to analyze, interpret, and report the different strategies and methods of teaching-learning experiences based on activities planned by the teacher and performed by the students. On top of them, significant relationship was determined. The respondents of the study involve the 304 students coming from 6 different class sections handled. The total size is 168 students determined by ratio and proportion on 55% out of 304 student population. The random sampling technique was used in selecting the respondents, the students from each section were required to draw a one-eight size rolled paper each (noted with x and y). All those who drew the rolled paper mark x are considered samples. The respondents have been grouped into males and females.

The research instruments employed in the study consisted of two sets. The first set was the questionnaire for assessing student's interest, enthusiasm, learned lessons, activities, comprehensiveness, acceptability, and appropriateness of the strategies applied by teachers in activity-based learning to include: drama, talk show, games, quiz bee and musikahan. This questionnaire is patterned after that of Philippine Australia Project on Basic Education Teaching Strategies and was administered after every activity was done. The activity-based teaching modalities: drama, talk show, games, quiz bee and musikahan was administered once, after each lesson. The second set of the research instrument was a teacher-made question for assessing performance on the lesson learned for every activity-based teaching strategy employed in this study. It was a 25 items test administered upon respondents before and after the conduct of each activity-based teaching modalities, which was done separately. The scores of the students in the pre and post tests are considered as dependent variables of the study.

Descriptive statistics was used to describe the student's test performance and activity-based learning such as mean, frequency, and percent. The t-test is used to determine the significant gains of the activity-based strategies employed in this study such as scores obtained from pre and post-test. And Pearson's Product

Moment Correlation and T-test is also used to determine the significant relationship between teaching-learning modalities and post-test scores of students in the activity-based learning strategies.

5 Results and Discussion

This chapter deals with the presentation, analysis, and interpretation of data gathered for the study.

5.1 Students' Performance in the Pre-test and Post-test when Subjected to Different Activity-Based Learning Modalities

Table 1 shows that data on the pre-test and post-test scores of respondents when subjected to different learning modalities.

Table 1

Pre-test and post-test scores of respondents in different activity-based teaching-learning modalities

Performance Level			Activity –Based Teaching-Learning Modalities				
			Game Show	Quiz Bee	Talk Show	Drama	Musikahan
Excellent	(21-25)	Post	65	63	32	33	14
		Pre	4	2	2	0	0
Very satisfactory	(16-20)	Post	17	19	49	39	51
		Pre	48	51	12	42	4
Satisfactory	(11-15)	Post	2	2	3	12	19
		Pre	30	29	33	26	44
Needs Improvement	(6-10)	Post	0	0	0	0	0
		Pre	2	2	35	16	36
Poor	(0-5)	Post	0	0	0	0	0
		Pre	0	0	2	0	0
Over-all Total Score		Post	3,884	3,722	3,419	3,411	3,423
		Pre	2,756	2,802	2,002	2,418	1,882
Average Score (Male)		Post	22.58	22.12	19.94	19.62	19.64
		Pre	16.08	16.59	11.19	13.28	10.53
Average Score (Female)		Post	22.21	21.15	19.81	20.04	20.16
		Pre	16.08	15.99	12.10	14.85	11.35
Over-all Average		Post	22.40	21.64	19.88	19.83	19.90
		Pre	16.025	16.29	11.64	14.06	10.94

The pre-test was administered by the teacher in order to determine the prior level of knowledge of students on the subject matter; this is done separately before the conduct of each activity-based learning modalities. Majority of the students obtained scores within the very satisfactory and satisfactory levels. Very few categorically fall under the excellent level. Also, a considerable number of students got the score under "Needs Improvement" especially in the talk show, musikahan and drama interventions or modalities. However, in the post-test conducted after the activity-based learning modalities, many of the students rose to the excellent level as evidenced by the increased of total scores of all respondents. Therefore, all interventions made by the teacher in presenting the lessons to the students were exceedingly effective. All have gained knowledge and skills noted in the increase of the scores of respondents from pre-test to post-test.

5.2 Tests of Relationship between Teaching Modalities and the Post-Test Scores of Respondents

Table 2 presents the results of the tests of significant relationships between learning modalities and post-test scores of respondents in the different activity-based learning.

Table 2
Results of the test of relationship between learning modalities and post-test scores of respondents

Activity-Based Learning Modalities	Coefficient r-value	Computed t-value	Probability	Decision
Game Show	0.8244	7.3798	0.000	Reject H_o
Quiz Bee	0.5491	8.5664	0.000	Reject H_o
Talk Show	0.3432	12.2371	0.000	Reject H_o
Drama	0.2934	12.4646	0.000	Reject H_o
Musikahan	0.3218	12.3449	0.000	Reject H_o

In terms of game show, the test yields a coefficient (r) value of 0.8244 signifying a very strong relationship between the learning modality and post-test scores of respondents. When the coefficient (r) was tested to determine the significant relationship, the test yields a t-value of 7.3798 with a probability of 0.000. This means that there is a significant relationship between game show as a teaching strategy. These findings imply that the high performance of the students in the post-test traceable to the appropriateness of the activity to the lessons prepared by the teacher.

On the other hand, when it comes to quiz bee, the test yields a coefficient value (r) of 0.5491 which implies a marked relationship between this activity-based learning process and the student's performance in the post-test. These marked relationships result in a t-value of 8.5664 which is greater than the critical t-value of 1.960. This implies that there is a significant relationship between quiz bee as activity-based learning and students' learning outcomes. Talk show, drama, and musikahan, all yields coefficient values of 0.3432, 0.2934 and 0.3218 respectively. They are regarded as slightly weak in terms of strengths of the relationships between the activity-based modalities of learning and students learning. However, when used to determine the significance of r-values, all come with 12.2371, 12.4646, and 12.3449 which are greater than the critical value of 1.960 at 0.05 level of significance. The result calls for the rejection of the null hypotheses. Therefore, there is significant relationships between talk how, drama and musikahan to the learning outcomes of the students. All those mentioned activity-based teaching-learning modalities are effective tools in as far as enhancing the performance of the students.

In summary, the activity-based teaching-learning modalities are all effective in enhancing the learning of the students. The interest of the students on the activities, eases to do away the boredom, motivate them to participate actively, encourage them to learn and provide them with enjoyment and enable them to accomplish the objectives of the lessons as being shown on their perceptions of every activity as the researcher also get the perceptions of the learners through the research instrument used that was patterned after that of the Philippine Australia Project on Education Teaching Strategies.

6 Conclusion

The respondents, who are subjected to activity-based teaching-learning modalities regarded game show, quiz bee, talk show, drama and musikahan as very satisfactory. They have the same level of perceptions on the activity-based teaching-learning modalities in lessons presentation. The activity-based teaching-learning modalities are acceptable to the taste of students as a mode of learning and teaching, and the methodologies

are influential factors on students' performance in Economics.

The pre-test and post-test results show significant differences. The level of knowledge about the lessons in the pre-test was on the needs improvement. The five (5) activity-based teaching-learning modalities are significantly related to the post-test scores of respondents.

Hence, teachers must appropriately select activity-based learning exercises that can evoke interest, enthusiasm, and encouragement to students' participation and they must learn to adopt varying strategies so that boredom among students can be eased out and prevented.

Conflict of Interests

The author declares that there is no conflict of interests regarding the publication of this paper.

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Performance–Based Learning Experiences and Achievement of Grade VII Freshmen in Elementary Algebra 1: Effective Inputs for the Enhancement of the K-12 Teaching Guide

Maris T. Lasco[1,2,*] *& Nelia S. Raganas*[1,#]
[1]College of Education, Caraga State University; Ampayon, Butuan City 8600, Philippines
[2]Mathematics Society of the Philippines-Caraga

ABSTRACT

This study sought to determine the performance-based learning experiences and achievement of Grade VII students in their Elementary Algebra 1(EA) subject. The students' performance and achievements were measured based on their learning experiences with respect to different determined domains. The frequency, percentage, arithmetic mean, correlation analysis and a partial correlation were used to analyze the data. The results conveyed that the students had a very satisfactory performance in their previous Mathematics and English subjects. However, their overall performance in EA is poor, except for their performance on the knowledge domain which is very satisfactory. The study further revealed that their performance in EA is highly correlated to oral recitation, group activity, board work and seatwork. The rest of the activities currently being employed did not show significant correlation. If their grades in Mathematics are held constant, only the group and board work activities have a high correlation. With these results, it is imperative to innovate and enhance the current Teaching Guide in EA for teachers.

Keywords: Elementary Algebra 1 (EA), Domains of learning, Learning Experiences, Performance-based

1 Introduction

Performance-based learning activities refer to tailor-fitted teaching techniques employed after a careful assessment of the students' performance to better aid learning. It provides a wide range of learning experiences in the classroom. Pedagogically, learners have increased engagement and motivation. This motivation, along with the use of learning strategies and self-regulation, is the key to the learners' achievement, emotions, and satisfaction (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011).

Performance-based learning concept in the education curriculum means an enhancement of the practices and the system that focuses on the students learning (Patrick & Sturgis, 2011). One concern about this system is the enhancement and innovations in learning Mathematics. Nowadays, the same scenario still exists in schools despite the many reforms in Mathematics teaching. The very recent reform in Philippine basic education is the implementation of the K-12 curriculum, which includes Math 7 or EA for Grade VII in Junior

*Corresponding Author
*E-mail: lascoomariss@gmail.com #nsraganas55@gmail.com

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High School. It was mentioned in the study of Nomi and Raudenbush (2014) that the National Mathematics Advisory Panel (2008) highlighted the significance of enhancing the mathematics topics in junior high school such as by teaching algebra. This topic is a very important foundation subject towards achieving enough understanding and analysis in Mathematics. It is from here that students will further their studies with higher Mathematics such as Geometry, Trigonometry, Logarithm, Statistics, and Probability.

Anent to this reform, the mathematics teachers are provided with the teaching guide for the grade 7 Mathematics. Notably observed is the fact that the teaching guide needs to be enhanced, to be more innovative and, at the same time, easy to relate to the learners' real-life experiences. The teaching guide and learner's guide are provided for all teachers and students as an aid in learning both for convenience and guide. These encouraged the researcher to investigate the performance-based learning experiences and achievements and its relation to the students' learning in EA.

2 Theoretical and Conceptual Framework

This study is anchored on the experiential learning theory of Kolb and Kolb (2005) with the work of the distinguished 20th century scholars like John Dewey, Kurt Lewin, Jean Piaget, William James, Carl Jung, Paulo Freire and Carl Rogers. The idea conveys that the experience is the core role in the theory of the learners understanding and development. According to Dewey's experiential learning theory that knowledge is acquired from experiences and socialization, where the role of the teacher is to manage the ideas of the learners based on actual experiences (Grady, 2003). Thus, the understanding and performance domains of learning in the study that manifests in the performance of the participants connote that learning experiences in the classroom may affect such performances in Mathematics. According to Kolb (1984), there is a transformation of learning through experience whether its objective or subjective, thus the knowledge domain must thoroughly understandable. Grasping the lessons from different experiences and transforming these into learning lead to the acquisition of knowledge. This process involves the use of performance-based learning activities in the classroom. In the concrete experience stage, learning is emphasized through personal involvement with people in everyday situations. The domains of learning-- study, knowledge, process, understanding, and performance, depend on the learning experiences of the participants. In this stage, the learner would tend to rely more on feelings than on a systematic approach to problems and situations. While in a learning situation, the learner relies on the ability to be open-minded and adaptable to change. On the other hand, Bruner's constructivist theory (1960) conveyed that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions--relying on a cognitive structure to do so. A cognitive structure such as the schema and mental models provide meaning and organization to experiences and allow the individual to be independent and to go further from what is being learned. Moreover, Dewey's Experiential Learning Theory (1938) detailed the connections between our activities and what happens, in consequence, the cut and try experience is made explicit.

The respondents of the study were randomly selected from all Grade 7 students in Ampayon National High School. The diagram below shows the schematic diagram of the study.

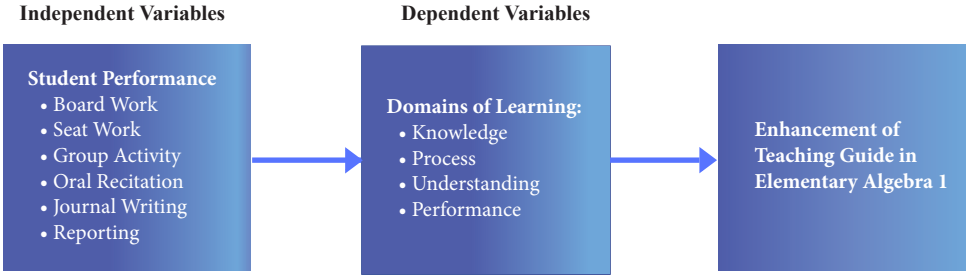

Fig. 1 Schematic Diagram of the Study

3 Methodology

Correlation analysis and partial correlation were used to test the hypotheses of the study. The population of the study involved the students in Grade 7 section Earth; this section was randomly selected from the four Grade 7 sections of Ampayon National High School. The rubrics used in assessing the activities were formulated by the researcher, her co-mathematics teachers, and experts in teaching EA. The criteria in the rubrics were formulated by considering the domains of learning. The domains of learning which are the knowledge, process, understanding, and performance were based on the K-12 Curriculum. The learning performance refers to the students' participation in the oral recitation, group activities and reporting activity during in the class. Meanwhile, achievement is the output, or score gained based on the performance of the students.

For the knowledge domain of learning, as defined by the Department of Education (2012), facts and information are the things that students need to acquire. The second domain of learning is the "process" which was defined as cognitive operations where students perform using facts and information for the purpose of constructing meanings and understanding. Effective cognitive learning in applying the word problems in Mathematics is manifested through the cognitive operations. The third is the "understanding" domain of learning, which according to the enduring big ideas principles and generalizations inherent to the discipline, may be assessed using the facets of understanding. The art of questioning by the teachers help the students to find meaning and understand the important ideas to gain effective transfer of learning (Wiggins & McTighe, 2005). The last domain of learning is the "product/performance" defined as the real-life application of understanding as evidenced by the students' performance of authentic tasks. The research instruments which were composed of the activity test questions and the second periodical examination questionnaire were validated by the researcher, Math teachers, and experts. The researcher made some modifications to the items to adjust the items to the students' level of experience.

As soon as the research proposal was approved, the researcher collaborated with two Math teachers who have been teaching EA in Grade 7 for almost five years. They are from another school in Butuan City Division. The Mathematics teachers, together with the researcher, evaluated and critiqued the rubrics to be used in evaluating the students' output.

The students' output was assessed by the researcher and the co-math teachers using the assessment tools. The seat work, quiz activity, board work and oral recitation activities of the students were scored based on how the students (1) used all appropriate information correctly, (2) applied appropriate procedure completely, and (3) if they clearly understood the problem, arrived at the correct solution and then made a general rule about the solution. In the reporting activity, the students earned perfect score if they can (1) speak clearly and effectively, (2) use appropriate mathematical terminology and symbols, and (3) integrate the topic into real-life situations. Moreover, in the journal-writing activity, students get a perfect score if they could (1) present accurate and insightful ideas, (2) provide depth and personal connections relevant to the topic, (3) understand clearly the topic, and (4) make a good journal with proper labels.

The researcher and the other two co-mathematics teachers rated the output of every learning activity of the students using the rubrics. The rating was decided unanimously by the researcher and co-mathematics teachers.

4 Results and Discussion

The personal profile of the students in terms of age shows that majority are aged 12 years old. The majority of the respondents obtained a very satisfactory level of performance in Math VI and English VI.

4.1 Level of Students' Performance in the Learning Experiences

The Problem-based activities are the student's hands-on experiences with the concepts in mathematics. The level of the respondents' performance in learning experiences and achievement in EA in terms of the

activities such as board work, seat work, group activity, oral recitation, journal writing, and math reporting are presented in Table 1.

Table 1
Distribution of the Respondents According to Math VI Grade

Grade Ranges	Frequency	Percent	Descriptive Rating
91 and above	11	27	Outstanding
86 – 90	30	73	Very Satisfactory
81- 85	0	0	Satisfactory
76 - 80	0	0	Poor
75 and below	0	0	Needs Improvement
Total	41	100	

The data showed that the students reached a very satisfactory level in Math VI which is a preparation for Grade VII mathematics in the K-12 curriculum. This implies that the basic and past knowledge in elementary years were the very important foundation to build new learnings in the higher Mathematics.

Table 2
Distribution of the Respondents According to Grade VI English Grade

Grade Ranges	Frequency	Percent	Descriptive Rating
91 and above	15	37	Outstanding
86 – 90	26	63	Very Satisfactory
81- 85	0	0	Satisfactory
76 - 80	0	0	Poor
75 and below	0	0	Needs Improvement
Total	41	100	

Table 2 implies that most of the students have a very satisfactory performance in English VI which is required in learning grade VII Mathematics since the medium of instruction is English. This further implies that the respondents must have at least a very satisfactory reading and comprehension ability to learn and understand mathematics.

Table 3
Summary of the Student's Achievement in the Performance-Based Learning Experiences

Grade Ranges	Board work	Seat work	Group Activity	Oral Recitation	Journal Writing	Math Reporting	Descriptive Rating
91 and above	5	2	3	11	13	4	Outstanding
86 – 90	36	19	21	29	27	36	Very Satisfactory
81- 85	0	9	16	0	1	0	Satisfactory
76 – 80	0	6	0	0	0	1	Poor
75 and below	0	5	1	1	0	0	Needs Improvement
Total	41	41	41	41	41	41	

The results shown in Table 3 imply that the students were able to achieve very satisfactorily because of their learning experiences. The data on the students' performance in board work, seat work, group activity, oral recitation, journal writing, and math reporting activities showed that the majority achieved a very

satisfactory performance rating. Henceforth, most of the students were able to participate and comply with the activities during the teaching-learning process. Through such achievement from learning experiences in the school, the students were able to grasp the concepts needed to be understood from the topic.

The study of Hartshorn and Boren (1990) supports the results: the learners' experiences through active involvement in the class is the context of experiential education. The best way to learn is by experience. How students are supported to develop these domain-specific competencies brings attention to the importance of the purpose and function of the relationship of instruction to learning.

Table 4

Students' Performance in the Domains of Learning in Elementary Algebra I

Grade Ranges	Domains of Learning				Total (100)	Descriptive Rating
	Knowledge (15)	Process/ Skills (25)	Understanding (30)	Performance (30)		
91 and above	10	2	0	0	0	Outstanding
86 – 90	20	2	1	0	2	Very Satisfactory
81- 85	4	9	3	0	2	Satisfactory
76 – 80	4	13	14	3	20	Poor
75 and below	3	15	23	38	17	Needs Improvement
Total	41	41	41	41	41	

The result implied that the respondents obtained a very satisfactory level in the knowledge domain of learning in EA (Table 4). It can be gleaned also that the respondents were poor in the process, understanding and performance domains of learning. They were only good in the knowledge domain of learning in defining, identifying, naming and memorization; but did not master the topics to apply the concepts in the other domains of learning where it involves the problem-solving analysis skills. The respondents cannot give meaning and connection to discrete facts and skills. The respondents applied some inappropriate procedure and presented an incomplete answer for the given problem. As such, the process, understanding and performance domains of learnings were not performed well.

Table 5

Correlation Analysis between Learning Experiences and Performance in Elementary Algebra 1

Learning Experiences	r	Sig.	Decision	Interpretation
Oral Recitation	0.526**	0.001	Do not accept H_o	Significant
Group Activity	0.645**	0.000	Do not accept H_o	Significant
Board work	0.589**	0.000	Do not accept H_o	Significant
Seatwork	0.487**	0.001	Do not accept H_o	Significant

**significant at $\alpha = 0.01$

The finding reveals that only the oral recitation, group activity, board work and seatwork activities of the students were highly correlated to the performance in EA (Table 5). Henceforth, those who do well in any of these performance-based activities mentioned have a greater tendency to do well in the paper-and-paper test in EA. This entails the form of learning where the learner is actively engaged in a task (Harris, Graham, Mason, & Sadler, 2002).

The findings in Table 6 implied that the students' learning performance and achievement in the group and board word activities were highly correlated with the performance in EA if Math Grade is controlled. In the group activity learning experience of the learner, it is supported by Kolb's theory (1984) that the

concrete experience stage of learning emphasizes personal involvement with people in everyday situations. In this stage, the learner would tend to rely more on feelings in cooperating towards its group mates than on a systematic approach to problems and situations.

Table 6

Partial Correlation between Learning Experiences and Performance in Elementary Algebra 1 Controlling for Math Grade

Control Variable			Performance in EA
Math Grade	Oral Recitation	Correlation	0.307
		Significance (2-tailed)	0.061
		Df	36
	Group Activity	Correlation	0.406*
		Significance (2-tailed)	0.012
		Df	36
	Seatwork	Correlation	0.029
		Significance (2-tailed)	0.864
		Df	36
	Board work	Correlation	0.477**
		Significance (2-tailed)	0.002
		Df	36

**significant at $\alpha = 0.01$ *significant at $\alpha = 0.05$

5 Conclusions and Recommendations

The findings of the study revealed that the performance-based learning in Mathematics of the students will depend also on the learning experiences, instructional materials and activities in school. The typical age is a factor that the students can use logical and coherent actions in thinking solving problems. However, the English and Mathematics performances must gain at least very satisfactory rating in the previous grade level will affect and tend to perform well to the next level. The learning experiences such as engaging to the activities in school such as board work, seat work; oral recitation, math reporting, journal writing, and oral recitation of the students will lead the students to easily grasp the concepts in mathematics which is needed to understand EA. But it was conveyed that only the oral recitation, group activity, board work and seatwork activities are highly correlated to the performance in EA.

The study further concluded that involving each student to do group activity with their peers and board work would help them perform better in learning mathematics. But it was found out that the overall performance in the Mathematics is poor except in the knowledge domain which is very satisfactory. Meanwhile, it is recommended for the teachers to develop more innovative, interactive and enjoyable activities. The positive environment and moderate usage of vernacular language shall be allowed in expressing the student's idea. Moreover, the journal writing activity and reporting activity are some of the assessments so that the students will practice the freedom of expression and develop analytical and creative thinking.

To promote the interest in learning more in EA, the mentors is recommended to design an activity in the class, so the students can participate in activities like group tasks and board work that express freely their ideas in Mathematics in their own way and be able to integrate what is being learned in real life situations. The further enhancement for the first, third and fourth quarter in the teaching guide is recommended to complete the enhancement activities of the current teaching guide in Mathematics 7.

Further study of this research in other public or private secondary schools in Caraga Region should be done by future researchers to verify the validity of its result.

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Elmer F. Conde, Department of Education - Agusan del Norte

Fernando T. Herrera, Caraga State University

Honey B. Tabiola, Philippine Normal University - Agusan

Jayrold P. Arcede, Caraga State University

Jondy M. Arpilleda, Surigao del Sur State University

Laila S. Lumibao, University of Science and Technology of Southern Philippines - Cagayan

Miraluna M. Herrera, Caraga State University

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