Indigenize-Blended Learning Approach: An Intervention to Improve Numeracy Skills of Non-Numerates Learners

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ABSTRACT

The study aims to reduce the number of non-numerate learners among Grade 7 students at Pintuyan National Vocational High School. The unified numeracy test results indicate a high number of non-numerate learners in this cohort. To address this, Mathematics Teachers must implement interventions that consider factors such as age, sex, family background, school attendance, interest, capabilities, behavior, and perceptions towards mathematics. By introducing simple, consistent practices through an indigenized-blended approach, the teachers aim to enhance numeracy skills and measure the effectiveness of these interventions. The ultimate goal is to increase the number of numerate learners while reducing the number of non-numerate learners, thereby overcoming learning hindrances and obstacles. This action research is focused on finding alternative mechanisms that support learners in improving their numeracy skills in an enjoyable manner.

Keywords: indigenize blended learning approach, numeracy skills, non-numerates learners, alternative mechanisms, effectiveness.

INTRODUCTION

Quality education is the mean objective in every learning institution. One of the identified problems in the school is to improve the numeracy skills of non-numerates learners. Lots of methods and techniques were introduced and practiced in the classroom, but there is one that we believed could give more relaxing and enjoyable for both the teacher and learners to learn effectively. Through structured teaching and learning activities, less congested classrooms, and flexible online information and communication technology, blended learning integrates online learning experiences and supports students in learning meaningfully (Kumar et al., 2021). According to Ożadowicz of (2020), discussed the value of blended learning in the COVID-19 era, which is something that every student has learned about and is putting into practice these days. For nearly two years, blended learning has been a part of research and practice in middle and higher education (Smith & Hill, 2019). The Pintuyan National Vocational High School aims to produce learners who can globally compete in any learning area, especially in Mathematics. The students' numeracy skill is one of the problems of all Mathematics teachers. It means that Math teachers should find ways to teach how enjoyable this subject is to learners' minds. The Academic department of this school gives special attention to those students identified as non-numerates. The benefits of localizing for students include: shielding them from their native culture; fostering motivation to study and retain it; and fostering better communication and the promotion of native culture (Laeen et al., 2019) while according to Gedawy et al., of (2019), Many nations have advocated for the early inclusion of computing instruction in their educational systems due to the significance of computational thinking. Together with the overall favorable impression, the assessment findings showed that students' computational thinking, logical reasoning, and analytical skills had improved.

Early childhood numeracy activities have been connected to children's eventual arithmetic performance. It was discovered that the majority of kids regularly participated in early numeracy activities (Clerkin & Gilligan, 2018). Understanding how the mathematics fits together and the meaning behind the structure are the challenges. It involves applying mathematical logic, reasoning, and problem-solving skills to understand the how and why underneath the hardened exterior (Schoenfeld, 2022). Students' attitudes toward mathematics, teachers' methods of instruction, and the school environment all have an impact on students' learning and

success in the subject (Mazana et al., 2019). Other contributory factors to this problem are; absenteeism, lack of interest, negative attitudes towards numbers, online games/social media, and poor study habits. The indigenized-blended learning approach is more specific. The instructional materials used are engaging, which will trigger the student's eagerness to learn and solve mathematical problems and promote community and student-teacher engagement in the learning process. As human development progresses, it is increasingly clear that individuals influence their surroundings and generate new behavioral consequences; hence, the active and selective nature of humans is crucial (Lerner, 2021). Numerous elements of the learning environment, including peers, the teacher, the teaching style, and particular learner traits, influence students' academic engagement (Amerstorfer & Freiin von Münster-Kistner, 2021). This study will strengthen learners; creativity in finding an easier way to solve mathematical problems, making their learning more meaningful.

Thus, the researcher conducts action research that aims to minimize or reduce the number of non-numerates learners. Furthermore, determine the effectiveness of the indigenize-blended learning approach as an intervention for the problem related to non-numerates learners in Mathematics 7 of the Grade 7 learners in Pintuyan National Vocational High School.

Objectives

This study seeks to use an indigenize-blended learning approach as an intervention to improve the numeracy skills of non-numerates learners of Grade 7 in Pintuyan National Vocational High School (PNVHS).

Specifically, this would answer the following questions:

1. Can the indigenize-blended learning approach help improve the numeracy skills of non-numerates learners?

2. How effective is the indigenize-blended learning approach in developing the numeracy skills of non-numerates learners?

3. How indigenize-blended learning approach does promote student-teacher engagement in the learning process?

ACTION RESEARCH METHODS

The research methodology is composed of the research design, research respondents/participants and other sources of data, data gathering methods, and data analysis.

The study will have to use a descriptive-correlation design. The descriptive part is on the use of the indigenize-blended learning approach and the numeracy skills of non-numerates among the struggling learners in Grade 7. The process of getting the significant relationship of the indigenize-blended learning approach and the numeracy skills of non-numerates lies in correlation.

Since the total number of the respondents of this action research encompasses only Thirty (30) students, the researcher would use the *T-Test* to straightly determine if there is a significant relationship between and to further test its hypothesis.

Participants and/or Other Sources of Data and Information

The participants of this research are Grade 7 Learners both the Bonifacio and Aguinaldo of Junior High School of Pintuyan National Vocational High School. The research environment focused inside the school's premises of Pintuyan National Vocational High School, Pintuyan, Southern Leyte. The total number of selected learners from Grade 7 is Thirty (30) to be considered as participants in this research, hence the total enumeration was completely employed. Table 1 shows the distribution of the participants accordingly.

Table 1. Distribution of Participants

Learners	Section	Number Of Participants	Percentage (%)
Grade 7 Students	Aguinaldo	15	50 %
Grade 7 Students	Bonifacio	15	50 %
Total =		**30**	**100 %**

Instruments

The Students Numeracy Profile SY: 2022 – 2023 for Quarters 3 up to 4 of Section Aguinaldo and Bonifacio on file was the source of the numeracy skill profile of the selected participants. Based on this data, the researcher analyzed the result or outcome.

Table 2. Students Numeracy Profile

Section: *AGUINALDO*				
Nos.	Name(s)	Scores(Add.Sub.Mul.Div.)	Interpretation	Status
1	Student A	5	MN	Need Enhancement
2	Student B	0	NN	Need Intervention
3	Student C	0	NN	Need Intervention
4	Student D	4	MN	Need Enhancement
5	Student E	0	NN	Need Intervention
6	Student F	0	NN	Need Intervention
7	Student G	0	NN	Need Intervention
8	Student H	0	NN	Need Intervention
9	Student I	0	NN	Need Intervention
10	Student J	0	NN	Need Intervention
11	Student K	0	NN	Need Intervention
12	Student L	0	NN	Need Intervention
13	Student M	0	NN	Need Intervention
14	Student N	3	MN	Need Enhancement
15	Student O	8	HN	No need for Intervention
Sub – Total =		*20*		

Legend: NN–Non-numerates (11), MN–Moderately Numerates (3), HN–Highly Numerate (1)

Section: _BONIFACIO_

Nos.	Name(s)	Scores(Add.Sub.Mul.Div.)	Interpretation	Status
16	Student P	0	NN	Need Intervention
17	Student Q	0	NN	Need Intervention
18	Student R	0	NN	Need Intervention
19	Student S	0	NN	Need Intervention
20	Student T	0	NN	Need Intervention
21	Student U	0	NN	Need Intervention
22	Student V	0	NN	Need Intervention
23	Student W	6	HN	No need for Intervention
24	Student X	0	NN	Need Intervention
25	Student Y	2	MN	Need Enhancement
26	Student Z	0	NN	Need Intervention
27	Student a	0	NN	Need Intervention
28	Student b	0	NN	Need Intervention
29	Student c	0	NN	Need Intervention
30	Student d	4	MN	Need Enhancement
Sub – Total =		_12_	_Mean:_	
Grand-Total=		$\sum$ _= 32_	$\overline{X}$ _= 1.06667_	

Legend: NN–Non-numerates (12), MN–Moderately Numerates (2), HN–Highly Numerate (1)

HISTORY:	_Legend_	_Total Number_	_Percentage (%)_
	NN = Non – numerate	23	77 %
	MN = Moderately Numerate	5	17%
	HN = Highly Numerate	2	6%
To get the Mean ($\overline{\mathbf{x}}$):			
**Given:** $\sum$ _- total scores of all learners = 32_ _n – total number of participants = 30_			
Solution (Substitution):			

$$\overline{X} = \frac{32}{30}$$

$$\overline{X} = 1.06667$$

Table 3 below simply shows the Students Numeracy Profile for the School Year 2022 up to 2023 with the Fourth (4th) Quarter Results. The table also reflects the scores of both section Aguinaldo as well as the section Bonifacio indeed. It can be seen on the table the accumulated scores of the learners based on their Addition and Subtraction also Multiplication as well as Division accordingly. It can be gleaned in the table their different interpretation such as (NN – Non-numerates and MN – Moderately Numerates also HN – Highly Numerates) as well as their status such as the following: Need Intervention,

Table 2. Students Numeracy Profile

Section: *AGUINALDO*				
Nos.	Name(s)	Scores(Add.Sub.Mul.Div.)	Interpretation	Status
1	Student A	5	MN	Need Enhancement
2	Student B	5	MN	Need Enhancement
3	Student C	5	MN	Need Enhancement
4	Student D	5	MN	Need Enhancement
5	Student E	0	NN	Need Intervention
6	Student F	5	MN	Need Enhancement
7	Student G	8	HN	No need for Intervention
8	Student H	7	HN	No need for Intervention
9	Student I	4	MN	Need Enhancement
10	Student J	0	NN	Need Intervention
11	Student K	0	NN	Need Intervention
12	Student L	6	HN	No need for Intervention
13	Student M	0	NN	Need Intervention
14	Student N	3	MN	Need Enhancement
15	Student O	8	HN	No need for Intervention
	Sub – Total =	*61*		

Legend: NN–Non-numerates (4), MN–Moderately Numerates (7), HN–Highly Numerate (4)

Section: *BONIFACIO*

Nos.	Name(s)	Scores (Add.Sub.Mul.Div.)	Interpretation	Status
16	Student P	11	HN	No need for Intervention
17	Student Q	0	NN	Need Intervention
18	Student R	0	NN	Need Intervention
19	Student S	0	NN	Need Intervention
20	Student T	4	MN	Need Enhancement
21	Student U	0	NN	Need Intervention
22	Student V	4	MN	Need Enhancement
23	Student W	12	HN	No need for Intervention
24	Student X	0	NN	Need Intervention
25	Student Y	12	HN	No need for Enhancement
26	Student Z	0	NN	Need Intervention
27	Student a	2	MN	Need Enhancement
28	Student b	0	NN	Need Intervention
29	Student c	0	NN	Need Intervention
30	Student d	5	MN	Need Enhancement
Sub – Total =		*50*	*Mean:*	
Grand-Total=		$\sum = 111$	$\overline{X} = 3.7$	

Note: NN–Non-numerates (8), MN–Moderately Numerates (4), HN–Highly Numerate (3)

HISTORY:	*Legend*	*Total Number*	*Percentage (%)*
	NN = Non – numerate	12	40 %
	MN = Moderately Numerate	11	37%
	HN = Highly Numerate	7	23%

DATA GATHERING METHODS

The researcher will have to adopt standardized tools for evaluation while crafting researcher-made instruments. Using the research instrument such as checklist and unstructured interview guide questions to gather the data. The researcher will have to conduct an orientation to the respondents about the benefits of indigenize-blended learning as an intervention to the numeracy skills of non-numerates among the struggling learners in Grade 7, such as its management of learning difficulty program. After the orientation, the researcher let the respondents answer the research instrument and some respondents will be asked to answer the unstructured interview question about the significant impact of indigenize-blended learning on the numeracy skill of non-numerates before and after the use of intervention and later on, the researcher would have to group their responses which will be then be grounded into two major themes. The researcher gathered the quarter's result in Grade 7 selected learners as well as their student's numeracy profiles. Indigenized-blended learning materials were promptly used by the researcher as her alternative intervention in teaching the learners to help them improve their numeracy skills and to habitually change the performance of her learners, especially those who were

(NN) Non-numerates learners. The researcher has adopted this indigenized-blended learning approach as an intervention to further improve such numeracy skills of non-numerates learners since June 27, 2023, and was barely intensified purposely. The information was sorted out after which, statistical analysis of data was done accordingly.

Data Analysis Plan

The gathered data will be analyzed and presented most appropriately. The data will be grouped into a control and experimental group based on the significant impact of indigenize-blended learning on the numeracy skills of non-numerates before and after the use of the intervention. For analysis and interpretation of data logically, the measure of central tendency will be used as a tool. In presenting and analyzing the information being gathered in the study, the following statistical tools were being used as well:

*Mean and Standard Deviation.*Both were employed appropriately to fully find out the number of learners who belonged to a certain numeracy skill level before and after using the indigenized-blended learning approach.

*T-test.*It was accordingly used for such independent samples to accurately answer if there is a great significant difference in the number of learners who belonged in a certain level of numeracy skill after using the indigenized-blended learning materials.

In administering the indigenize-blended learning, before presenting the competency and expected learning outcomes, the teacher will have to review the skill, explain the purpose of the lesson, build on past lessons using blended learning approach, and model how to learn the skills through the aid of indigenized-materials for smooth instruction delivery. During the learning of skills, the teacher displays a mathematical problem on the interactive show me board and with the aid of indigenized materials for unlocking difficulties. Have students understand the problem. Call students to come up with the show me board and highlight the key concepts and given data and surrounding number clues, and have them share their thinking and discuss, and to confirm their thinking, have students search for what mathematical operations needed to know what process has to make to solve the problem. The assessment of numeracy skills may require multiple subtests from different instruments and any decision should be based on converging evidence of a deficit in all the relevant dimensions of numeracy.

Innovation, Intervention, and Strategy

This study aimed to use an indigenize-blended learning approach program that helps the numeracy skills of non-numerates and improves the learner's abilities in terms of numbers. It may also lighten the burden of teachers in solving mathematical problems, which also helps the learners to enjoy oral recitation of numbers and working together with their peers. It would create more positive engagement with students and significantly contribute to learning behavior towards Math subjects (Saka, 2019).This action research proposes such innovation that would give way as an intervention to the identified problem that the PNVHS is facing nowadays, honestly speaking to those high numbers of non-numerate learners, especially Grade 7 students. The mere strategy of this action research is to focus on the indigenize-blended approach so that all learners would feel quite excited about how this process would look. There are many alternative and possible ways to deal with the situation of non-numerate learners, and this is just one of the great examples. In addition, with this kind of approach, learners would be more engaged and trained to enhance and slowly improve their numeracy skills throughout the process by using and with the aid of indigenized materials that will surely add to the students' willingness to participate more and always active (Fellner, 2018).The researcher proposed a more convenient way of dealing with the current problem that most Mathematics Teachers are experiencing. With the advent of this concept, non-numerate learners would entail participatory involvement so that, little by little, they would be familiarized with how the so-called approach was meant to be. Lastly, Mathematics Teachers will also be more concerned with their students since this ideology would also promote a strong bond with a teacher-learner relationship that will boost participation in all activities (Pastore & Luder, 2021).

RESULTS AND DISCUSSION

Presented in Table 4 is the result in conducting the Students Numeracy Profile for the Third (3rd) and Fourth (4th) Quarters respectively in Grade 7 Aguinaldo and Bonifacio accordingly.

Table 4. Students Numeracy Profile of the Grade 7 Learners Based on 3rd & 4th Quarter Results

QUARTER 3 RESULTS						QUARTER 4 RESULTS					
(NN) Non-numerates	Percent (%)	(MN) Moderately Numerates	Percent (%)	(HN) Highly Numerates	Percent (%)	(NN) Non-numerates	Percent (%)	(MN) Moderately Numerates	Percent (%)	(HN) Highly Numerates	Percent (%)
23	77%	5	17%	2	6%	12	40%	11	37%	7	23%

It can be gleaned from Table 4 that based on the Student's Numeracy Profile Third (3rd) Quarter Results, before the indigenized-blended learning intervention applied by the researcher which is using indigenized-blended learning materials, the Grade 7 learners had a total number of 23 out of 30 learners or 77% who belonged to (NN) Non-numerates, while there were 5 or 17% who belonged to (MN) Moderately-Numerates and 2 learners or 6% who belonged to (HN) Highly-Numerates. Based on the Student's Numeracy Profile Fourth (4th) Quarter Results, after using the indigenized-blended learning approach as an intervention of the researcher, the Grade 7 participants had a total number of 12 or 40% who belonged to (NN) Non-numerates, while there were constant 11 or 37% who belonged to (MN) Moderately-Numerates and 7 or 23% belonged to (HN) Highly-Numerates. Presented in Table 5 is the numeracy level of the Grade 7 learners before using the indigenized-blended learning approach based on Third (3rd) Quarter Results.

Table 5. Numeracy Level of the Grade 7 Learners Before Using Indigenized-Blended Learning Approach Based on the Third (3rd) Quarter Results

Quarter Results	Mean	N	Std. Deviation
Third (3rd) Quarter	1.06667	30	2.16449

Legend: 0- Non-numerates, 1-5 Moderately-Numerates, 6-12 Highly-Numerates

Table 5 shows that based on the Third (3rd) Quarter Results before the indigenized-blended learning intervention being implemented by the researcher which is using the alternative approach, the Grade 7 learners had a total mean of 1.0667 with a standard deviation of 2.16449. This implies that the majority of the learners belonged to the non-numerates level. It can be further said that the indigenized-blended learning intervention of the researcher before the conduct of the Third (3rd) Quarter Test was not enough.

Shown in Table 6 is the numeracy level of the Grade 7 learners after using such an indigenized-blended learning approach based on the Fourth (4th) Quarter Results.

Table 6. Numeracy Level of the Grade 7 Learners After Using Indigenized-Blended Learning Approach Based on the Fourth (4th) Quarter Results.

Quarter Results	Mean	N	Std. Deviation
Fourth (4th) Quarter	3.7	30	3.81602

Legend: 0 Non-numerates, 1-5 Moderately-Numerates, 6-12 Highly-Numerates

Table 6 shows that based on the Fourth (4th) Quarter Results after the indigenized-blended learning intervention being implemented by the researcher which is using the alternative indigenized-blended learning materials, the Grade 7 learners had a total mean of 3.7 with a standard deviation of 3.81602. This implies that the majority of the learners belong to the (HN) Highly-Numerates level. The significant improvement of the numeracy level of the learners shows the effectiveness of the numeracy intervention applied by the researcher after the conduct of the Fourth (4th) Quarter Results.

Table 7 presents the significant difference in the numeracy level of the Grade Seven (7) Learners after the implementation of alternative indigenized-blended learning materials.

Table 7. Significant Difference in the Numeracy Level of the Students After Using the Indigenized-blended Learning Approach in Teaching Numeracy

	Paired Differences			t	df	Sig. (2-tailed)	Description
	Mean	Std. Deviation	Std. Error Mean				
(3rd) Quarter (4th) Quarter	-2.63333	-1.65153	2.38333	17.16887	30	2.110	Difference is significant

Legend: If p-value >5% level of significance, significant; otherwise not.

It can be gleaned from Table 7 that there is a significant difference in the numeracy level of the learners after using the indigenized-blended learning approach. Using *the t*-test, the numeracy level of the learners got at the value of 17.16887 (p=2.110). This result indicates the learner's improved numeracy level after implementing the indigenized-blended learning approach. As reflected in the outcome of the research, the use of the indigenized-blended learning approach as an alternative intervention of the researcher is found to be effective in improving the numeracy skill of the learners. It can be derived that an effective educator conveys a wide range of teaching mechanisms that will set the parameter for classroom work-related activities (Arcavi, 2023). Mathematics Teachers should improvise a way where learners can engage in fun and exciting activities that will not only boost their interests but approach whatever potentials they have. When activities are varied, students or learners are challenged, participation is greatly motivated, and thinking is improved.

CONCLUSION AND RECOMMENDATIONS

Based on the findings, this action research concludes that the indigenize-blended learning approach as an intervention can help to improve the numeracy skills of non-numerates learners, and it does promote student-teacher engagement in the learning process as well as it is an effective way to further develop the numeracy skills of non-numerates learners merely. The researcher further recommends that this indigenized-blended learning approach is a good example of an intervention to aid in improving the numeracy skills of non-numerates learners, so this action research when continuously applied and fully implemented might be of great help not just only for those non-numerates learners but as well as to all Mathematics Teachers out there indeed, and surely it would be an advantage and thus, beneficial to all the students of Grade 7 Aguinaldo and Bonifacio accordingly. The realization of this action research focused on the indigenized-blended learning approach: as an intervention to improve the numeracy skills of non-numerates learners would be of big impact to the students of Pintuyan National Vocational High School.

REFERENCES

1. Amerstorfer, C. M., &Freiin von Münster-Kistner, C. (2021). Student perceptions of academic engagementand student-teacher relationships in problem-based learning. Frontiers in psychology, 12, 713057.
2. Clerkin, A., & Gilligan, K. (2018). Pre-school numeracy play as a predictor of children's attitudes towards mathematics at age 10. Journal of Early Childhood Research, 16(3), 319-334.

3. Fellner, K. D. (2018). Embodying decoloniality: Indigenizing curriculum and pedagogy. American journal of community psychology, 62(3-4), 283-293.

4. Gedawy, H., Razak, S., &Alshikhabobakr, H. (2019, July). The Effectiveness of Creating Localized Content for Middle School Computing Curriculum. In Proceedings of the 2019 ACM Conference on Innovation and Technology in Computer Science Education (pp. 478-484).

5. Kumar, A., Krishnamurthi, R., Bhatia, S., Kaushik, K., Ahuja, N. J., Nayyar, A., & Masud, M. (2021). Blended learning tools and practices: A comprehensive analysis. Ieee Access, 9, 85151-85197.

6. Laeen, S. J., Ayati, M., Sani, H. J., &Booreng, M. A. (2019). A Teachers Perception on Localization of Curriculum with Emphasis on Social Studies Lesson. International Journal of Higher Education, 8(7), 84-94.

7. Lerner, R. M. (2021). Children and adolescents as producers of their own development. In Individuals as Producers of Their Own Development (pp. 75-102). Routledge.

8. Mazana, Y. M., Suero Montero, C., & Olifage, C. R. (2019). Investigating students' attitude towards learning mathematics. https://doi.org/10.29333/iejme/3997

9. Ożadowicz, A. (2020). Modified blended learning in engineering higher education during the COVID-19 lockdown—Building automation courses case study, Educ. Sci., vol. 10, no. 10, pp. 292.

10. Pastore, G., & Luder, R. (2021). Teacher-Student-Relationship Quality in Inclusive Secondary Schools: Theory and Measurement of Emotional Aspects of Teaching. Frontiers in Education, 6. https://doi.org/10.3389/feduc.2021.643617

11. Saka, T. W. (2019). An exploration of mathematics classroom culture in selected early grade mathematics classrooms in Malawi. University of Johannesburg (South Africa).

12. Schoenfeld, A. H. (2022). Why are learning and teaching mathematics so difficult? in Handbook of cognitive mathematics (pp. 1-35). Cham: Springer International Publishing.

13. Smith, K., & Hill, J. (2019). Defining the nature of blended learning through its depiction in current research. Higher Education Research & Development, 38(2), 383-397. https://doi.org/10.1080/07294360.2018.1517732