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Duality of codes over a certain ring of order 2^m

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Abstract: We introduce a non-unital and non-commutative ring $S_m(\mathbb{F}_1)$, called ring of ordered sum over $\mathbb{F}_2$, the binary field. We discuss linear codes over this ring, also known as S_m-codes, and their algebraic structure, particularly, their residue and torsion codes. We explore the generalized notion of duality of S_m-codes.

Keywords Self-orthogonal codes, Self-dual codes, Quasi self-dual codes, Type IV codes, Non-unital ring

1 INTRODUCTION

Self-dual codes and self-orthogonal codes, and consequently, Type IV codes, which are self-dual codes where all the codewords have even weight, have been studied extensively for their vast applications. Many examples of these types of codes have good parameters. Classically, these codes are defined over finite fields. Recently, there have been great interest in codes over finite rings. However, these rings are often commutative, and most of the time, unital [**?**, **?**, **?**]. If the ring is noncommutative and without the unity, the usual notion of duality as in finite fields and other commutative rings [**?**, **?**] have to be reconsidered. In particular, left and right duals need to be defined, as in quasi-self dual (QSD) codes.

In this paper, we introduce the ring $S_m(\mathbb{F}_2)$, called the ring of ordered sum over the binary field $\mathbb{F}_2$, defined as

$$S_m(\mathbb{F}_2) = \{(a_1, a_2 \ldots, a_m) | a_1, a_2 \ldots, a_m \in \mathbb{F}_2\}$$

together with the following binary operations, addition and multiplication respectively,

$$(a_1, \ldots, a_m) + (b_1, \ldots, b_m) = (a_1 + b_1, \ldots, a_m + b_m),$$

$$(a_1, \ldots, a_m) \cdot (b_1, \ldots, b_m) = \left(a_1 \sum_{i=1}^{m} b_i, \ldots, a_m \sum_{i=1}^{m} b_i \right).$$

We call linear codes over this ring simply as S_m-codes. We will redefine the notion of duality of S_m-codes. Moreover, for an S_m-code C, we associate binary codes called residue and ith torsion, for $i = 1, 2, \ldots, m-1$. We then study the structure of QSD codes of length n, defined as self-orthogonal codes of size $2^{\frac{mn}{2}}$ and Type IV codes, defined as QSD codes with all codewords of even Hamming weight, in terms of their residue and torsion codes. The conditions for the existence of these codes will be given.

2 PRELIMINARIES

2.1 THE RING $S_m(\mathbb{F}_2)$

In this section, we give some basic properties of the ring $S_m(\mathbb{F}_2)$.

Theorem 1. *Let*

$$O_m(\mathbb{F}_2) = \{(a_1, a_2, \ldots, a_m) \in S_m(\mathbb{F}_2) \mid \sum_{i=1}^{m} a_i = 0\}.$$

Then $O_m(\mathbb{F}_2)$ is a commutative ideal of $S_m(\mathbb{F}_2)$ and $S_m(\mathbb{F}_2)/O_m(\mathbb{F}_2) \cong \mathbb{F}_2$.

The ideals of $S_m(\mathbb{F}_2)$ can be characterized as follows.

Proposition 1. *For positive integer m, $S_m(\mathbb{F}_2)$ has ideal J_i of size 2^{m-i} for all $i = 0, 1, \ldots, m$ and*

$$J_m \subseteq J_{m-1} \subseteq \cdots \subseteq J_1 \subseteq J_0,$$

where $J_m = \{0\}$, $J_{m-1} = \{0, c_{m-1}\}$, $J_1 = O_m(\mathbb{F}_2)$ and $J_0 = S_m(\mathbb{F}_2)$.

As a consequence of the proof of Proposition 1, we can write every element of $S_m(\mathbb{F}_2)$ in a certain form.

Corollary 1. *Let $c_i \in J_i \setminus J_{i+1}$ for $i = 0, 2, \ldots, m-1$ with $J_0 = S_m(\mathbb{F}_2)$. Then any element of $S_m(\mathbb{F}_2)$ can be written in the form*

$$\beta_0 c_0 + \beta_1 c_1 + \ldots + \beta_{m-1} c_{m-1},$$

where $\beta_i \in \mathbb{F}_2$.

2.2 CODES OVER $S_m(\mathbb{F}_2)$

A **(linear) S_m-code** of length n is a one-sided $S_m(\mathbb{F}_2)$-submodule of $S_m(\mathbb{F}_2)^n$. Two S_m-codes are **permutation equivalent** if there is a permutation of coordinates that maps one to the other.

The number of nonzero coordinates of a vector $\mathbf{x} \in S_m(\mathbb{F}_2)^n$ is called its **(Hamming) weight** denoted by $wt(\mathbf{x})$. The **(Hamming) distance** $d(\mathbf{x}, \mathbf{y})$ between two vectors $\mathbf{x}, \mathbf{y} \in S_m(\mathbb{F}_2)^n$ is defined as $d(\mathbf{x}, \mathbf{y}) = wt(\mathbf{x}-\mathbf{y})$. The **minimum distance** of an S_m-code $\mathcal{C}$ is

$$\begin{aligned} d(\mathcal{C}) &= \min\{d(\mathbf{x}, \mathbf{y}) | \mathbf{x}, \mathbf{y} \in \mathcal{C}, \mathbf{x} \neq \mathbf{y}\} \\ &= \min\{wt(\mathbf{c}) \mid \mathbf{c} \in \mathcal{C}, \mathbf{c} \neq \mathbf{0}\}. \end{aligned}$$

We endow $S_m(\mathbb{F}_2)^n$ with the usual inner product

$$\mathbf{x} \cdot \mathbf{y} = \sum_{i=1}^{n} x_i y_i$$

where $\mathbf{x} = (x_1, \ldots, x_n), \mathbf{y} = (y_1, \ldots, y_n) \in S_m(\mathbb{F}_2)^n$. Let C be an S_m-code. The **right dual** of C is the right module defined as

$$C^{\perp_R} = \{\mathbf{y} \in S_m(\mathbb{F}_2)^n \mid \forall \mathbf{x} \in C, \mathbf{x} \cdot \mathbf{y} = 0\},$$

and the **left dual** of C is the left module defined as

$$C^{\perp_L} = \{\mathbf{y} \in S_m(\mathbb{F}_2)^n \mid \forall \mathbf{x} \in C, \mathbf{y} \cdot \mathbf{x} = 0\}.$$

The **two-sided dual** of C, denoted by $C^{\perp}$ is defined as $C^{\perp} = C^{\perp_R} \cap C^{\perp_L}$. A code is **left self-dual** (resp. right self-dual) if it is equal to its left dual, i.e., $C^{\perp_L} = C$ (resp. right dual, i.e., $C^{\perp_R} = C$). A code C is **self-dual** if $C = C^{\perp}$ and **self-orthogonal** if $C \subseteq C^{\perp}$.

An S_m code C of length n is **left nice** (resp. **right nice**) if $|C|\left|C^{\perp_L}\right| = 2^{mn}$ (resp. $|C|\left|C^{\perp_R}\right| = 2^{mn}$). Moreover, it is called **quasi self-dual** (QSD) if it is self-orthogonal and of size $2^{\frac{mn}{2}}$. A quasi self-dual code with all Hamming weights even is called a **Type IV** code.

Define the map of reduction modulo $O_m(\mathbb{F}_2)$ as the map $\alpha : S_m(\mathbb{F}_2) \to \mathbb{F}_2$ given by $\alpha((a_1, a_2, \ldots, a_m)) = \sum_{i=1}^{m} a_i$. This map can be extended naturally to a map from $S_m(\mathbb{F}_2)^n$ to $\mathbb{F}_2^n$. For an S_m-code C, we associate two binary codes:

1. the **residue code** defined by $res(C) = \{\alpha(\mathbf{y}) \mid \mathbf{y} \in C\}$, and
2. the i^{th} **torsion code** for $i \in \{1, 2, \ldots, m-1\}$ defined by

$$tor_i(C) = \{\mathbf{x} \in \mathbb{F}_2^n \mid c_i \mathbf{x} \in C\},$$

where $c_0, c_1, \ldots, c_{m-1}$ are fixed such that $c_0 \in S_m(\mathbb{F}_2) \setminus O_m(\mathbb{F}_2)$, $c_i \in O_m(\mathbb{F}_2)$, $i \neq 0$.

Lemma 1. *Let C be an S_m-code. Then every codeword $\mathbf{c} \in C$ can be written as*

$$\mathbf{c} = c_0 \mathbf{x}_0 + c_1 \mathbf{x}_1 + \ldots + c_{m-1} \mathbf{x}_{m-1},$$

where $\mathbf{x}_0 \in res(C)$ and $\mathbf{x}_i \in \mathbb{F}_2^n$. Moreover, $res(C) \subseteq tor_i(C)$ for $1 \leq i \leq m-2$.

3 SELF-ORTHOGOGNAL AND QSD S_m-CODES

We start with a generalized construction of S_m-codes.

Theorem 2. *Let B_i's be linear codes over $\mathbb{F}_2$ such that $B_0 \subseteq B_i \subseteq B_0^{\perp}$ for $0 \leq i \leq m-1$, where B_0 is self-orthogonal binary code of length n, and $|B_i| = 2^{r_i}$ such that $r_0 + r_1 + \ldots + r_{m-1} = \frac{mn}{2}$. The code C defined by*

$$C = c_0 B_0 + c_1 B_1 + \ldots + c_{m-2} B_{m-2} + c_{m-1} B_{m-1},$$

is a quasi self-dual code. Its residue code is $res(C) = B_0$ and torsion codes $tor_i(C) = B_i$.

Thus, we can write an S_m-code as a direct sum as follows.

Corollary 2. *If C is a linear code over $S_m(\mathbb{F}_2)$, then*

$$C = c_0 B_0 \oplus c_1 B_1 \oplus \cdots \oplus c_{m-1} B_{m-1},$$

where $B_0 = res(C)$ and $B_i = tor_i(C)$ for $i = 1, 2, \ldots, m-1$.

Note that we can choose the r_i's such that $r_0 \leq r_{i-1} \leq r_i$ for all $i = 1, 2, \ldots, m-1$.

Corollary 3. *If B_i are binary codes for $i = 0, 1, \ldots, m-1$ such that $B_0 \subseteq B_i$ for all i, then there exist an S_m-code C with residue code B_0 and $tor_i(C) = B_i$. Furthermore, if B_0 is self-orthogonal and $B_i \subseteq B_0^{\perp}$ for all i, then C is self-orthogonal. Moreover, $r_0 + r_1 + \ldots + r_{m-1} = \frac{mn}{2}$ where $|B_i| = 2^{r_i}$ for $0 \leq i \leq m-1$ then C is quasi self-dual code.*

The next result characterizes the residue and torsion codes of self-orthogonal S_m-codes.

Lemma 2. *For all self-orthogonal S_m-linear codes C we have*

1. *$res(C) \subseteq res(C)^{\perp}$;*
2. *$tor_i(C) \subseteq res(C)^{\perp}$;*
3. *$tor_{m-1}(C) = res(C)^{\perp}$ if C is QSD and the sequence $r_0, r_1, r_2, \ldots, r_{m-1}$ is an arithmetic progression.*

Corollary 4. *Let C be an S_m-code of length n. Then C is QSD if and only if $tor_i(C) \subseteq res(C)^{\perp}$ for all i and $r_0 + \ldots + r_{m-1} = \frac{mn}{2}$.*

Theorem 3. *Let C be an S_m-code of order n such that C is QSD and m is even. If there exists $l \in \mathbb{Z}$ such that the sequence $r_{\frac{m}{2}}, \ldots, r_{m-1}$ is the same sequence as $r_0 + l, \ldots, r_{\frac{m}{2}-1} + l$ and $r_{\frac{m}{2}-1} + r_{\frac{m}{2}} = n$, then $tor_{m-1}(C) = res(C)^{\perp}$.*

We have an analog of Lemma 2 for QSD S_m-codes.

Theorem 4. *For all quasi self-dual S_m-linear codes C we have*

1. $res(C) \subseteq res(C)^{\perp}$;
2. $tor_{m-1}(C) \subseteq res(C)^{\perp}$ *(if* $m = 2$, $tor_{m-1}(C) = res(C)^{\perp}$*);*
3. *if C is of type $\{k_0, \ldots, k_{m-1}\}$, then*

$$mk_0 + (m-1)k_1 + \ldots + 2k_{m-2} + k_{m-1} = \frac{mn}{2}.$$

Moreover, if $m \geq 3$, $res(C)$ is self-dual if and only if C is Type IV.

As a consequence, we have the following construction of Type IV codes.

Corollary 5. *If $C = c_0B + c_1B + \ldots + c_{m-1}B$, such that B is binary self-dual code, then C is a Type IV code.*

Finally, we end this section with the general notion of duality of S_m-codes.

Theorem 5. *If C is an S_m-code, then the following hold.*

1. $res(C^{\perp_L}) = tor_i(C^{\perp_L}) = res(C)^{\perp}$ *for all* $i = 1, 2, \ldots, m-1$
2. $res(C^{\perp_R}) = \bigcap_{i=1}^{m-1} tor_i(C)^{\perp}$
3. $tor_i(C^{\perp_R}) = \mathbb{F}_2^n$ *for all* $i = 1, 2, \ldots, m-1$

We illustrate all these results in the following example.

Example 1. *Let* $C = c_0 \begin{pmatrix} 0 & 0 \end{pmatrix} + c_1 \begin{pmatrix} 1 & 1 \end{pmatrix} + c_2 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$. *Note that* $|C| = 2^3$ *and* $res(C) \subseteq tor_i(C) \subseteq res(C)^{\perp}$ *for* $i = 1, 2$ *which means C is quasi self-dual. Observe that*

$$C^{\perp_R} = c_0 \begin{pmatrix} 0 & 0 \end{pmatrix} + c_1 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} + c_2 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

since $tor_1(C)^{\perp} = \begin{pmatrix} 1 & 1 \end{pmatrix}^{\perp} = \begin{pmatrix} 1 & 1 \end{pmatrix}$ *and* $tor_2(C)^{\perp} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}^{\perp} = \begin{pmatrix} 0 & 0 \end{pmatrix}$. *Thus,*

$$res(C^{\perp_R}) = tor_1(C) \cap tor_2(C) = \begin{pmatrix} 0 & 0 \end{pmatrix}$$

and we have

$$C^{\perp_L} = c_0 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} + c_1 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} + c_2 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

since $res(C^{\perp_L}) = tor_i(C^{\perp_L}) = res(C)^{\perp} = \begin{pmatrix} 0 & 0 \end{pmatrix}^{\perp} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$. *Therefore,*

$$C^{\perp} = C^{\perp_R} \cap C^{\perp_L} = c_0 \begin{pmatrix} 0 & 0 \end{pmatrix} + c_1 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} + c_2 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

which means $|C| \cdot \left|C^{\perp}\right| = 2^3 \cdot 2^4 = 2^7 \neq 2^6$ *and hence, C is not nice, that is, C is not self-dual.*

3.1 CONCLUSION

The ring $S_m(\mathbb{F}_2)$ is a relatively new ring, which may generalize some known rings. More properties of this ring needs to be explored, especially its application to coding theory and other fields. Future work in codes over this ring includes formulation of more examples for longer length and larger finite fields or other rings in the list of [**?**]. A complete classification of self-orthogonal, self-dual and QSD S_n-codes for some n will also be valuable work in the future. This can be accomplished using a mass formula, similar to what was done in other rings.

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A Mathematical App for the Conceptual Understanding of Area and Perimeter

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Abstract: This paper discusses an app that was developed to build a strong understanding of the concepts of area and perimeter in students. An important feature of the app is the three-component feature which highlights progressive learning: *Explore,* designed for the learning of the conceptual understanding of area and perimeter; *Apply*, where area and perimeter concepts are applied; and *Create* intended for constructing representations to develop higher order thinking skills. The pedagogical basis for the creation of the app, the game design elements employed in the app as well as the integration of the app in the classroom will be presented.

Keywords: Mathematical app, area and perimeter, area, perimeter

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A note on the usage of Likert Scaling for research data analysis

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Abstract

In this paper, biases on some used known method adapting Likert Scaling are shown. Then, an improvement of the method to correct or minimize the bias is presented in order to have better interpretation of the result of the analysis of the data.

Keywords: bias, bipolar scaling, difference, Likert Scale, psychometric scale, rating scale, statistical tool.

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A Visualization App on Proving Geometric Concepts

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Abstract: This paper discusses the description, design and pedagogical basis of a mathematical app called *Two Column Proof*, which provides students a framework for writing proofs of geometric statements. The app focuses on proving concepts on: properties of parallelograms, conditions that determine when a quadrilateral is a parallelogram, properties on trapezoids and kites for high school mathematics. It employs visual representations for students to understand the statement or reason of each given line in the proof, strengthening their logical and mathematical knowledge needed in the proof construction.

Keywords: Mathematical app, two column proof, STEM, mathematical proofs

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Absolute μS_p-functions and μS_p-Connectedness *

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Abstract

In this paper, the concepts of absolute μS_p-open, absolute μS_p-closed functions, absolute μS_p-continuity, and μS_p-connectedness in generalized topological spaces are introduced and some of their properties are established.

Mathematics Subject Classification: 54A05

Keywords: absolute μS_p-open functions, absolute μS_p-closed functions, absolute μS_p-continuous functions, μS_p-connectedness

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An Investigation on the Effect of the Difficulty of an Item in A Multiple Choice Examination When Item Choices are Rearrange

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ABSTRACT

A study was conducted to know if rearranging item choices in an item of a multiple choice test affects the behavior of the examinees the way they look at the item difficulty of the given items. Two sets of test instruments (pretest and modified posttest) containing fifteen items were made with the same items but item choices for the modified posttest instrument were rearranged. Among the 205 examinees who took the test during a two-week time interval, their responses were modeled using the Rasch model. Results show that the estimates of the item difficulties for the majority of the fifteen items between the two tests were different. Majority of the items given in the exam showed an increase in the difficulty level as viewed by the examinees. The effect on the difficulty maybe due to the time interval the two sets of test were administered, that is first, students forget what they learned and see the items as difficult (time factor) and second, the rearrangement of the choices in each items in the post test affected the student's way they see in dealing the items of the test which partly contributed to the increase of the level of difficulty of majority of the items in the test.

Keywords: Difficulty, Item Response Theory, Item Choices, Rasch Model, Rearrange.

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BOOK REVIEW

Investigating the Effects of Different Distance Learning Modalities on Student Academic Performance in Technology Education Programs

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Keywords
Academic performance, assessment, asynchronous, blended learning, synchronous, technology education

ABSTRACT
The rise of online distance learning has necessitated investigations into its effectiveness across various educational contexts. This study examines the academic performance of students enrolled in technology education programs across three distinct learning modalities: synchronous, asynchronous, and blended. The study aims to determine if significant differences in academic performance exist among these modalities and how they vary across different assessment types (formative, performance-based, and examination). Forty-five students were equally divided into three groups, each experiencing one of the learning modalities. A non-parametric Kruskal-Wallis test was employed to analyze the academic performance data. The results indicated significant differences in student performance across the three learning modalities, particularly in formative assessments where blended learning yielded significantly higher scores compared to synchronous and asynchronous modalities. The superior performance in the blended learning modality was consistent across performance-based tests and examinations. Notably, the highest academic performance was observed in the students who engaged in blended learning and were assessed through performance-based tests. Asynchronous learning consistently resulted in lower performance across all assessment types. These findings suggest that blended learning may be a more effective pedagogical approach in technology education, facilitating enhanced academic performance compared to purely synchronous or asynchronous online learning environments.

App for Addition and Subtraction of Integers

By Debbie Marie B. Verzosa[1], Ma. Louise Antonette N. De Las Peñas[2], Maria Alva Q. Aberin[2] and Len Patrick Dominic M. Garces[2]

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This paper presents a mobile app, AlgeOps, created to assist students in understanding addition and subtraction of integers. The design of the app amalgamated the neutralization model (based on cancelling integers of opposite signs) and the number line model to offer a more holistic representation of integers. Furthermore, since AlgeOps presents two objects, boxes and balloons, the learning objective may be extended to adding and subtracting polynomials. Pre- and post-assessments, student observations and interviews with teachers and students revealed the app can increase performance, facilitate conceptual development, and increase engagement in tasks involving integer addition and subtraction.

integer models need to supplement the representations offered by real-life contexts.

Models for integer addition and subtraction can be classified into two broad categories: *neutralization* and *number line* models (Stephan & Akyuz, 2012). The neutralization method is based on cancelling integers of opposite sign. The use of red and black rods to represent positive and negative integers respectively, by the ancient Chinese, is one of the earliest examples of the neutralization method (Merzbach & Boyer, 2011). When ten black rods and ten red rods appear together on the counting board, these are considered to add to nothing, and are removed off the board.

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App-based scaffolds for writing two-column proofs

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ABSTRACT

This paper presents apps designed to assist students in understanding and developing proofs in geometric theorems. These technologies focus on triangle congruence, triangle similarity and properties of parallelograms. Focus group discussions and initial testing of the apps revealed that the apps offered a more engaging medium for learning proving and were capable of facilitating proof-writing skills in geometry.

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Proofs; two-column proofs; mobile technologies

Bridging the Mathematics Gap Through the Use of Mathematical Apps

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Abstract: *During the COVID-19 pandemic, school campuses worldwide were forced to close, and students had to learn primarily from home. This sudden disruption is estimated to have caused significant learning loss among learners. This paper reports the use of mathematical applications (apps) to bridge the mathematical learning gaps in Grades 1 to 11 in the Philippines after the pandemic, as part of a project funded by a national government agency. The apps include those that strengthen foundational concepts in number and fraction sense in grade school mathematics, develop proving skills in geometry, promote mastery in algebraic and trigonometry through drill and practice, and facilitate statistical understanding and reasoning. The description of the apps, their design, and pedagogical basis are discussed. Challenges encountered in the implementation of the project are also presented.*

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Caught in the crossfire: biodiversity conservation paradox of sociopolitical conflict

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The current state of global biodiversity is confronted with escalating threats arising from human-induced environmental changes and a growing array of unpredictable challenges. However, effective conservation efforts are often hindered by limited knowledge, especially in developing economies such as the Philippines. The limitations imposed by these shortfalls in biodiversity knowledge hamper the capacity to protect biodiversity in light of the continuing extinction crisis. Our study revealed that areas with higher conflict levels exhibited lower species richness, fewer occurrence records, and reduced forest cover. This finding provides initial evidence for the relationship between sociopolitical conflict and biodiversity in the Philippines. We posit that the security risks caused by sociopolitical conflicts could have a negative impact on conservation efforts, particularly in terms of monitoring and implementing measures to protect natural resources. The links that bind armed conflict and biodiversity conservation are multifaceted and complex issues that warrant greater scientific and political attention. Finally, we identified 10 meaningful approaches to address shortfalls in biodiversity knowledge in conflicted areas, particularly incorporating conflict-sensitive approaches, considering the geopolitical context and conflict dynamics to adapt and align their strategies with local realities for more effective conservation efforts.

Research Square

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or referenced by the media as validated information.

Caught on the Crossfire: Biodiversity Conservation Paradox of Sociopolitical Conflict

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Abstract

Biodiversity loss is a growing concern globally, but there's a lack of knowledge on where to focus conservation efforts. It is therefore essential to determine priorities and barriers to biodiversity knowledge generation. In this context, we present evidence from the Philippines on how sociopolitical instability drives biodiversity shortfall. Our study showed that conflict leads to fewer biodiversity records, with low-conflict areas having higher turnover by more than 50%. Further, tree cover loss is lower in high-conflict areas. Security risks due to sociopolitical conflicts can significantly affect biodiversity recording efforts, potentially leading to underestimating species diversity in these regions. This study highlights the link between conflicts and biodiversity shortfalls, and the negative impact on biodiversity documentation efforts. While rare positive consequences exist, they are incidental and overall negative. Addressing the convergence of conflict, extremism, and biodiversity conservation is crucial for safeguarding ecosystems and human and nature's well-being.

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Challenging Deficit Perspectives in Developing Countries: Teachers' Explanations of Fraction Concepts

Debbie Marie Verzosa[1]

ABSTRACT Dominant discourses in teacher development often posit teachers as being lacking in knowledge, beliefs, or skills, thus justifying the "need" for further development and for educational reforms. This perspective shaped the analysis of Filipino teachers' explanations of fraction concepts using the constructs of content knowledge and pedagogical content knowledge, leading to an interpretation that reinforced deficit narratives about teachers. However, there are increasing contestations of these deficit research narratives (Adiredja, 2019) that neither acknowledge the larger context that contributes to the ways teachers perform nor highlight the productive resources that teachers may draw upon in their teaching. This paper aims to illustrate a reconceptualization of the research away from focusing on what teachers lack towards identifying the ways by which teachers' fractional explanations reflect their constructed perception of ideal mathematics teaching as shaped by the broader system where education takes place. This is my attempt to acknowledge my own participation in the deficit perspective and challenge the narrative about education in a developing country.

Keywords: Developing countries; Preservice teachers; Fractions; Anti-deficit.

CHILDREN SOLVING WORD PROBLEMS IN AN IMPORTED LANGUAGE: AN INTERVENTION STUDY

Debbie Verzosa

Abstract

This paper reports on one aspect of a two-year design study aimed to assist second-grade Filipino children solve additive word problems in English, a language they primarily encounter only in school. With Filipino as the medium of instruction, an out-of-school pedagogical intervention providing linguistic and representational scaffolds was implemented with 17 children. Pre-intervention, children experienced linguistic difficulties and were limited to conceptualising and solving simple additive structures. Post-intervention interviews revealed improved understanding of more complex structures, but only when linguistic difficulties were minimised. Filipino children from disadvantaged families are expected to learn mathematics and solve word problems in English, a language they primarily encounter only in school (Young, 2002). Thus, it is not surprising that many Filipino students who have completed two or three years of schooling are unable to solve even simple addition and subtraction word problems (Bautista, Mitchelmore, & Mulligan, 2009; Bernardo, 1999). While language problems often arise as a cause for poor performance in mathematics (Philippine Executive Report on the TIMSS, cited by Carteciano, 2005), what is not clear is whether lack of English language proficiency is the main reason for Filipino children's poor problem-solving performance. This study attempts to provide insight into these issues by addressing the following research questions: 1. Is the failure to solve problems due to linguistic difficulties and/or to an inadequate understanding of the semantic structure and associated mathematical relationships in the given problem? 2. Is it possible to improve young Filipino children's strategies for solving addition and subtraction word problems

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TOPICAL REVIEW

Climate-induced stressors to peace: a review of recent literature

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Keywords: climate change, peace, conflict, war, adaptation, environmental security

Supplementary material for this article is available online

Abstract

Climate change is increasingly recognized as a threat to global peace and security. This paper intends to provide a better understanding of the nature of interactions between climate change and events that undermine peace through a systematic review of recent literature. It highlights major methodological approaches adopted in the literature, elaborates on the geographic focus of the research at the nexus of climate change and peace, and provides further information on how various climatic stressors, such as extreme temperature, floods, sea-level rise, storms, and water stress may be linked to different events that undermine peace (e.g. civil conflict, crime, intercommunal violence, interstate conflict, political conflict, and social conflict) through direct and indirect pathways. Results confirm previous findings that statistical techniques and qualitative case studies are dominant methods in climate-conflict research but show that there has been an increase in the geographic information system based risk analyses and qualitative comparative analyses in the recent years. In line with previous reviews, results show that the literature is mainly focused on certain regions of the world and several major regions that have experienced numerous conflicts over the past few years and/or are vulnerable to adverse climatic events are understudied. However, a new finding is that, in the past few years, there has been an increasing focus on Asia, which contrasts with previous reviews that show an African focus in the literature. Also, there is an unbalanced attention to different climatic stressors and peace-related events. Interactions between water stress/extreme temperature and civil and interstate conflicts have received more attention. A major finding is that, only under certain conditions climatic stressors may act as driving forces or aggravating factors. In fact, there is a strong consensus that climate change is less likely to undermine peace in isolation from a wide range of contextual socio-economic and institutional factors such as political instability, poor governance, poverty, homogeneous livelihood structures, and ethnic fractionalization. However, such contextual factors can contribute to undermining peace via either direct or indirect pathways. The former may occur through direct psychological/physiological effects of climatic impacts or via competition over scarce resources. In contrast, in indirect pathways climate change may lead to conflict through diminishing livelihood capacities and/or inducing migration. In addition to synthesizing literature on contextual factors and direct/indirect pathways, the review identifies gaps that need further research.

Proceedings of Bridges 2014: Mathematics, Music, Art, Architecture, Culture

Color Symmetry in the Hand Woven Mats of the Jama Mapun

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Abstract

The Jama Mapun is an indigenous Filipino community known for their hand-woven mats. Their technique is impressive given that their designs are directly woven into the mat, and are not produced by simply painting or inserting colored leaves in completed mats. In this paper, we highlight concepts in color symmetry evident in the Jama Mapun mats. We discuss perfect and non-perfect colored designs including a finite, frieze and wallpaper pattern.

Community Math Stations as a Learning Opportunity for Preservice Teachers

August 2020 · PRIMUS

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Debbie Verzosa

Abstract

This paper describes a project that sought to simultaneously facilitate the mathematical learning of both preservice teachers (PSTs) and schoolchildren. The project involved the organization of community Math Stations related to research-based number sense activities, and was integrated within two university-level courses. This article describes strategies for addressing the challenges associated with organizing such a project, and shows how the project contributed to the learning of PSTs with respect to content knowledge, pedagogical content knowledge, and general pedagogy. Suggestions for organizing a similar project in other settings are also discussed.

Comparison of Item Difficulty Estimates in a Basic Statistics Test using ltm and CTT Software Packages in R

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***Abstract*—Two free computer software packages "ltm" and "CTT" in the R software environment were tested to demonstrate its usefulness in an item test analysis. The calibration of the item difficulty parameters given the binary responses of two hundred five examinees for the fifteen items multiple choice test were analyzed using the Classical Test Theory (CTT) and Item Response Theory (IRT) methodologies. The software latent trait model "ltm" employed the IRT framework while the software classical test theory functions "CTT" operated under CTT. The IRT Rasch model was used to model the responses of the examinees. The conditional maximum likelihood estimation method was used to estimate the item difficulty parameters for all the items. On the other hand, all the item difficulty indices using the "CTT" software were also calculated. Both the statistical analyses of this study were done in the R software. Results showed that among the fifteen items, the estimates of their item difficulty parameters differed mostly on their values between the two methods. In an IRT framework, items showed extreme difficulty or easy cases as compared to CTT. However, when the estimated values were categorized into intervals and labelled according to its verbal difficulty description, both methodologies showed some similarities in their item difficulties.**

***Keywords*—Classical test theory; indices; item calibration; item difficulty; item response theory; R software**

anytime for test construction. This method is useful for test makers in the composition of test items and the determination of the difficulty or easiness of the test instrument.

The primary objective of this paper is to demonstrate the usefulness of the two computer software programs, the latent trait model "ltm" [1] and the classical test theory functions "CTT" [2] in the R software environment in the calibration of item difficulty parameter estimates/indices for a multiple-choice test. Two methodologies, the item response theory and the classical test theory will be used. Specifically, this study will employ the Rasch model [3], an IRT probabilistic model which is part of the logistic model family, to model the responses of all the examinees for all the items. Estimation for all the item difficulty parameters will be carried using the conditional maximum likelihood estimation [4]. The calculated item difficulty estimates will be compared to the calculated difficulty indices of the same test examination that uses the scores of the examinees under the classical test theory methodology. One point of interest in this study is the comparison of the verbal description of the items in terms of its difficulty labels. Here we will know whether each item estimates are comparable for both methodologies or they both possess extreme differences.

II. Background of the Study and Related Studies

Congruence Between Context and Opportunities for Professional Development of Mathematics Teachers in the Philippines

November 2017
DOI: 10.1007/978-981-10-2598-3_7
In book: Professional Development of Mathematics Teachers

Debbie Verzosa · Maria Theresa Tulao-Fernando · Catherine P. Vistro-Yu

Abstract

Like in many other developing countries, mathematics education in the Philippines is often intertwined with macro problems that arise from the sociopolitical context of schools. We investigate the extent to which preservice and in-service education are able to prepare secondary teachers for teaching mathematics at the level of ordinary classrooms. Our analysis is based on the scholarly literature as well as on in-depth interviews with 22 classroom teachers from 12 of 17 Philippine regions who were accepted in a special credential program. We also discuss the macrostructures that exact considerable influence on classroom teaching.

Rw-Connectedness and rw-Sets in the Product Space [1]

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Abstract

In this paper, the concept of rw-connectedness and rw-sets in the product space is studied. Specifically, this paper characterized rw-connectedness in terms of rw-open and rw-closed sets and rw-continuous functions. This also established some results involving regular open, regular semiopen, rw-interior, and rw-closed sets in the product of subsets of a topological space.

Mathematics Subject Classification: 54A05

Keywords: rw-open functions, rw-closed functions, rw-connectedness

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Crystallographic patterns in Philippine indigenous textiles

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Keywords: symmetry; color symmetry; Philippine indigenous textiles.

The aim of this study was to analyze a representative sample of Philippine indigenous textiles in order to capture the range of symmetries and color symmetries present. This paper examines the existence of symmetries in finite designs, and classifies the plane-group and frieze-group symmetry types of the repeated patterns in woven textiles. The tendency of a particular symmetry to be more or less common than another can indicate relationships between the symmetries and the weaving technique or the culture that produced them. This paper will also examine designs and patterns with color symmetry found in these textiles. The sample consisted of 588 repeated patterns and finite designs in textiles (389 plane, 166 frieze and 33 finite) culled from well known museums in the Philippines, personal collections of scholars, existing literature on Philippine textiles and field visits.

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Abstract: *In the Philippines, one challenge that continues to be faced by the Department of Education in bringing educational content in a blended learning modality is the lack of internet access of the learners. This paper discusses the distribution, through a community LTE network, of mathematical resources for Grades 7 to 10 to teachers and students of a particular high school in the Philippines. It also gives details on particular technological tools (mathematical applications) that were created to help the mathematical learning of students in a remote setting.*

Shih, JL. et al. (Eds.) (2023). Proceedings of the 31st International Conference on Computers in Education. Asia-Pacific Society for Computers in Education

Design of a Mobile App to Promote Understanding and Fluency in Finding the Equation of a Line

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Abstract: This paper focuses on the design of a mobile app called *Pick or Fish* that fosters comprehension and mastery of the concepts of slopes, *y*-intercepts and equations of lines. The app's pedagogical value lies in its potential to help students understand and become proficient in these concepts. The app is suitable for use on low-cost mobile devices. It functions within an engaging game-like setting featuring visual elements that enable students to see the effect of parameter changes on the direction of a line. The beginner and advanced levels of the app have scaffolding features that gradually introduce the students to the key aspects of linear functions. The mechanics of the app, its pedagogical basis and how integration in the classroom may be achieved as teachers plan the lesson, facilitate open-ended discussion and encourage independent use of the app are also discussed.

Keywords: Lines, slopes, *y*-intercept, equations of lines, mobile app

Designing Mobile Apps to Promote Numeracy and Statistical Reasoning

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Abstract: *Even with major advancements in the field of mathematics education, many students still do not attain the learning competencies prescribed by official curricula. This may be partially explained by students' immersion in classrooms characterized by superficial strategies or rote-learning methods. This paper reports on the design of mobile applications (apps) developed by the authors as part of an ongoing project funded by a national government agency and intended to promote structural thinking and statistical reasoning. It describes the general features of the apps, as well as the pedagogical principles upon which the apps' designs were anchored on. These principles are grounded on research and established practices on number sense and statistical learning. Collaborations with the Philippine Department of Education for widespread implementation and sustainability are also discussed.*

Designing Performance Tasks in Mathematics Using Technological Tools

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Abstract: *In the Philippines, the performance task is one of the major summative assessments in the K to 12 curriculum. This paper discusses how performance tasks may utilize mathematical apps within the context of blended learning. Guidelines on designing performance tasks, as well as the GRASPS framework, are discussed. Performance tasks that cut across various grade levels and strands of mathematics are presented. These involve divisibility (Numbers), integer and polynomial operations (Algebra), triangle centers (Geometry), and statistics (Statistics). The performance tasks described in this paper can provide an initial idea for the design of other summative assessments and contribute to the*

Designing Mobile Apps to Promote Numeracy and Statistical Reasoning

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Abstract: *Even with major advancements in the field of mathematics education, many students still do not attain the learning competencies prescribed by official curricula. This may be partially explained by students' immersion in classrooms characterized by superficial strategies or rote-learning methods. This paper reports on the design of mobile applications (apps) developed by the authors as part of an ongoing project funded by a national government agency and intended to promote structural thinking and statistical reasoning. It describes the general features of the apps, as well as the pedagogical principles upon which the apps' designs were anchored on. These principles are grounded on research and established practices on number sense and statistical learning. Collaborations with the Philippine Department of Education for widespread implementation and sustainability are also discussed.*

Development of a mobile ten frames app for Philippine K-12 schools

November 2020

Conference: 28th International Conference on Computers in Education · At: Online

Debbie Verzosa · Ma. Louise Antonette Navarro De Las Peñas · Jumela Sarmiento · Show all 5 authors · Mark L Loyola

Abstract

This paper reports on the Quick Images app, whose design framework is informed by research on ten-structured thinking and gamification principles. Inclusivity was also a major consideration, especially in the context of a developing country. Thus, the app was made freely available and required only moderate system requirements. Pilot studies revealed that the app has the potential to promote children's ability to see two-digit numbers in relation to tens and ones, which is a major goal of elementary school mathematics. Collaborations with the Philippine Department of Education to ensure the app's sustained use are also discussed.

Developing Competency in Two-Column Proof-Writing via Interactive Software Applications

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Abstract

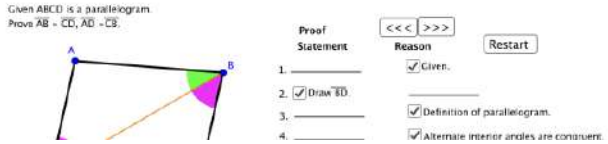
Dynamic tools in geometry act as a platform for student learning by allowing students to manipulate representations, observe the consequences, and formulate conjectures. In line with this direction, educators are now conceptualizing applications that may be used to sharpen students' ability to formulate proofs for geometric statements.

As such, this poster describes software applications designed to facilitate the understanding and writing of proofs for geometric statements on triangle congruence, triangle similarity, and properties of parallelograms. *Provelt* is an Android-based application that provides users a framework for conceptualizing and thinking about proofs. Another application developed is a GeoGebra-based tool that provides a step-by-step proof alongside relevant visual support. Both applications were designed so that they can be accessed using mobile devices such as smartphones and tablet computers.

Focus group discussions and initial testing of the applications revealed that the applications offered a more engaging medium for learning proof-writing and were capable of facilitating proof-writing skills in geometry.

GeoGebra-Based Application for Two-Column Proofs

We have written a number of applets on proving theorems using two column proofs using the dynamic software GeoGebra. These applets provide students a framework for writing proofs by allowing them to visualize given statements of the proof. To navigate the proof, the student clicks the right arrow button. A line of the proof appears and the student writes the answer to the blank. To visualize the statement given, the box provided is ticked.



Rodrigo, M. M. T. et al. (Eds.) (2021). Proceedings of the 29th International Conference on Computers in Education. Asia-Pacific Society for Computers in Education

Development of a Gamified Number Line App for Teaching Estimation and Number Sense in Grades 1 to 7

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Abstract: Fraction knowledge is known to be a gatekeeper to more advanced mathematical learning. On the basis of the literature on early number learning, a number line mobile application called *Catch the Carrot* was designed to develop students' knowledge of whole number and fraction magnitude. This paper aims to describe the design of the *Catch the Carrot* app and discusses the rationale for using number lines as representational scaffolds for developing children's understanding of numbers, particularly their estimation and number sense skills. The gamification features of the app, as well as strategies for integration in a classroom are also presented. This app, which utilizes number line representations, is expected to deliver the benefits associated with using number lines in instruction as suggested by the literature. The next step is to investigate the extent to which the gamified number line app promotes number sense and mathematical competence.

Keywords: Mathematical app, number sense, estimation, number line, STEM

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Development of an App and Videos to Support the Fraction Learning Trajectory from Grades 1-7

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Abstract: Lack of procedural fluency in fractions impedes access to advanced mathematical courses and limits opportunities for entry into STEM-related fields. This paper describes the design and pedagogical basis of the *Moving Fractions* app and supplementary fraction videos for promoting fraction learning. *Moving Fractions* utilizes game-design factors to draw students through a trajectory of fraction learning from part-whole comparisons to a more robust understanding of the measurement concept of fractions. The supplementary video immerses students in a broad range of fraction representations. The app and video are intended to form a fraction learning package for distribution in Philippine schools. Future work involves the gathering of empirical data for validating the expected benefits associated with the application of mathematics education research in the app and video design.

Keywords: mathematical app, fraction, STEM, educational video

Digital Simulations for Grade 7 to 10 Mathematics

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This article describes a Department of Science and Technology – Philippine Council for Industry, Energy and Emerging Technology (DOST-PCIEERD) project aimed to facilitate the implementation of the mathematical objectives raised by the Department of Education's (DepEd) K to 12 program in the Philippines through the use of innovative digital technologies. In particular, a selection of application software ("apps") were created for Grade 7 to 10 mathematics that covered topics indicated in the five strands outlined in the K to 12 program – namely (1) number, (2) geometry, (3) measurement, (4) patterns and algebra, and (5) statistics and probability. The design of the apps was informed by an amalgamated framework of the Cognitive Theory of Multimedia Learning (Mayer 2005) and Mathematical Theories of Representation (Goldin 1998). The design was informed by how students learn and how students learn mathematics. The project also aimed to design manipulable software that allows learners to construct and grapple with their mental representations of mathematical concepts. This paper describes a selection of the apps designed by the project and how their features were informed by the theoretical framework. It also presents results from pilot studies that demonstrate the apps' potential to increase performance, facilitate conceptual development, and increase learners' engagement.

Keywords: application, K to 12 program, mathematical software, mobile technology, technology in mathematics education

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Does Retention Interval Matters in Mathematics Performance?

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Abstract

This study describes and investigates if an association exist between the retention intervals of the three-grouped student respondents in high school and their performance in the basic algebra. The respondent's performances were categorized into different proficiency levels namely the far below basic, below basic, basic, above basic and proficient. Results revealed that a highly significant association was found between the retention intervals and the level of performance of the respondents. The level of performance of the respondents significantly increased with varying retention interval. An improved shift in the level of performances were observed from test to retest. The recall of information in the basic algebra was strengthened as retention interval increases particularly to high performing students. Respondents' exposure to related advance academic mathematics learnings, practice as well as maturity may have contributed to the mathematical performance across retention intervals of the respondents.

Keywords: Basic algebra; performance; proficiency; association; retention interval.

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Abstract: *The use of real data in teaching and learning statistics has been recommended in the literature. This paper talks about the development and implementation of the Senso Eskwela Pilipinas, the first database in the Philippines that builds and provides real data with the intention of making the study of statistics engaging, understandable, relatable, and relevant for Filipino learners.*

Shih, JL. et al. (Eds.) (2023). Proceedings of the 31st International Conference on Computers in Education. Asia-Pacific Society for Computers in Education

Enhancing Trigonometry Learning through a Mobile App

Maria Alva Q. ABERIN[a,*], Ma. Louise Antonette N. DE LAS PEÑAS[a], Agnes D. GARCIANO[a], Juan Carlo F. MALLARI[a], Jumela F. SARMIENTO[a], Mark Anthony C. TOLENTINO[a], & Debbie Marie B. VERZOSA[b]
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Abstract: A mobile app called *Trigomatch* is designed for students to gain an in-depth understanding of trigonometric concepts in an engaging and dynamic learning environment. A description of the app as well as the pedagogical framework and game design principles that form the backbone of the app are discussed.

Keywords: Mobile app, trigonometry, trigonometric ratios

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Factors influencing Filipino children's solutions to addition and subtraction word problems

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School of Education, Macquarie University, Sydney, Australia

(*Received 25 April 2009; final version received 12 August 2009*)

Young Filipino children are expected to solve mathematical word problems in English, which is not their mother tongue. Because of this, it is often assumed that Filipino children have difficulties in solving problems because they cannot read or comprehend what they have read. This study tested this assumption by determining whether presenting word problems in Filipino or reading them aloud to children in either language facilitated solution accuracy. Contrary to the initial hypothesis, reading word problems aloud did not seem to improve student performance ($p > 0.10$). In contrast, presenting word problems in Filipino significantly improved solution accuracy ($p < 0.0001$) and led to differences in error patterns – children were less likely to use an inappropriate arithmetic operation when problems were presented in Filipino. However, the language of the problem had minimal effects on the more difficult Compare problem type. Finally, the benefits of using Filipino were more pronounced for low-achieving students who may have lower proficiency in English than their high-achieving peers ($p < 0.01$).

Keywords: arithmetic; English as a second language; comprehension; primary

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Full Text Article

Farming amidst climate change: The contextual vulnerability of farmers in Cotabato, Philippines

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Abstract

This research investigated the contexts of farmers in Cotabato, Southern Philippines, and the various aspects of their vulnerability to climate change. The response of the government to address the climate vulnerability of farming communities was also examined. A mixed-methods approach that included document analysis, surveys, interviews, and focused group discussions was used to gather the data for the study. Salient themes from qualitative data were discussed side by side with the results generated from quantitative data. The different aspects of contextual vulnerability investigated—the nature of farming itself, population age groups, education, income, multiple deprivations, farm assets, farming practice, and limited government response—work together to characterize the vulnerabilities of farmers. They also exacerbate, compound, and reify each other. The susceptibilities and multiple deprivations of farmer households through limited formal education, poverty, and lack of social support challenge their adaptation and resilience to climate change. Farmers remain vulnerable to the impacts of climate change despite the existence of a government plan that recognizes their plight. A holistic view of these vulnerabilities is highly recommended in drafting programs and optimal solutions for the issues related to climate change.

JOURNAL OF AGRICULTURAL RESEARCH, DEVELOPMENT, EXTENSION AND TECHNOLOGY
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Full Text Article

Fish catch assessment of the nine fish species at Ligawasan marsh, North Cotabato, Philippines

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Citation: Flores, P.A., Nitafan, R.P., Augstin, J.R.F. & Pimentel, J.L. (2024). Fish catch assessment of the nine fish species at Ligawasan marsh, North Cotabato. *Journal of Agricultural Research, Development, Extension and Technology*, 6(1), 63-79. https://doi.org/10.5281/zenodo.15037200

Abstract

Farmers' nine important fishes were assessed to determine relative abundance from data of fish catch landings and catch per unit effort (CPUE) in Ligawasan marsh from January to March 2022. The study gathered data from total fish catch landings, gear selectivity, catch per unit effort (CPUE) and length-weight relationship from fish catch landings. Results of the study showed that mudfish (*Channa striata*), tilapia (*Oreochromis niloticus*), and common carp (*Cyprinus carpio*) were the abundant species in the marsh. Gear selectivity was observed in some species. Length-weight relationship was compared to a similar wetland data. Shorter range for length were found in Ligawasan marsh fish species except for gourami (*Trichopterus trichogaster*) compared in the report from the study in Agusan marsh. The present study can provide baseline data on relative abundance of fish resources present in the marsh which can be used as reference to develop policy on sustainable management based in Ligawasan marsh, North Cotabato, Philippines.

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Publication Date: April 25, 2022
DOI:10.14738/assrj.94.12273.
Pimentel, J. L., & Garcia, A. J. S. (2022). Genetics or Environment: Tracing the Root Cause of Increasing Homosexual Population. Advances in Social Sciences Research Journal, 9(4). 369-376.

SOCIETY FOR SCIENCE AND EDUCATION

Genetics or Environment: Tracing the Root Cause of Increasing Homosexual Population

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ABSTRACT

The number of homosexuals at present is enormously increasing in the Philippines. These homosexuals established themselves in the academe, government, services, industry and in the private sectors. They contributed a lot in the society shaping government policies where they were given attention especially in their demands of acceptance and equality. However, some homosexuals are also contributing the spread of disease particularly HIV-AIDS due to their sexual practices and activities. The increase of this group of individuals causes a distortion on the growth of human population since they do not produce offspring due to same sex partnership. This study investigated the root cause of homosexuality and the link of these homosexual's sexual orientation and behavior with its family influences, environment, exposure to violence and childhood experiences. It has been a long debate known as nature-nurture debate whether homosexuality is caused by genetics or environment. Using a constructed validated questionnaire, four hundred fifty-five persons that have tendencies to be homosexuals were selected and their responses were gathered. Describing their sexual orientations, out of the total 455 individuals, 56 (12.3%) were straight males and 88 (19.34%) were straight females, 96 (21.09%) admitted to be bisexual, 123 (27.03%) were gays and 91 (20%) were lesbians. The results of data analysis using Chi-square test, showed that there was a significant association between the sexual orientation and the birth order as well as an individual having a homosexual sibling and history of childhood abuse.

Keywords: Birth order, Environment, Genetics, Homosexuality, Sexual Orientation.

International Conferences e-Society 2024 and Mobile Learning 2024

GEOGEBRA APPLETS FOR FOSTERING CONCEPTUAL UNDERSTANDING IN ALGEBRA

Ma. Louise Antonette N. De Las Peñas[1], Mark Anthony C. Tolentino[1], Maria Alva Q. Aberin[1], Agnes D. Garciano[1], Juan Carlo F. Mallari[1], Jumela F. Sarmiento[†,1] and Debbie Marie B. Verzosa[2]
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ABSTRACT

This paper discusses two *GeoGebra* applets, *Radical* and *Parabola*, that are designed to strengthen the conceptual understanding of specific topics in algebra. The design and pedagogical basis of the applets are presented. The integration of the applets in teaching Grade 9 mathematics in a partner high school in the Philippines is then discussed. Finally, we report feedback gathered from students and teachers during this integration. Their feedback indicates the potential of these applets for improving students' learning of algebra.

KEYWORDS

Mobile Technology in Teaching Mathematics, Mathematical Applets, *Geogebra* Applets, Algebra Applets

Research Article

Heuristic Approach to Nursing Students' Achievement Test Scores

Angel Lhi F. Dela Cruz*, Leonard M. Paleta
For affiliations and correspondence, see the last page.

Abstract

The study compared various approaches to the teaching of science. The evaluation of performance incorporates teaching and learning concepts. A random selection yielded 82 students of comparable academic standing. Both the pre-test and post-test groups were given instruction that was activity-based. The fact that the control group did better than the experimental group. It demonstrates that the conventional approach is the most effective way to instruct cellular respiration. Hence, the results of the traditional method were significantly better than those of the heuristic one. It has been shown to improve student achievement when taught in a conventional manner. Because males performed better than females, it can be concluded that gender and instructional methods in cellular respiration have no bearing on one another. The paper suggests that conventional approaches to education should be utilized in the classroom more frequently. This is especially the case if the method is able to pique the interest of male students. According to the result of the study, the advantage of heuristics is not restricted in any way because females perform well on heuristic achievement assessments.

Keywords: *conventional method, heuristic method, achievement scores, male, female, cellular respiration*

Interactive Mobile Applications for Teaching and Learning Mathematics

Ma. Louise Antonette N. De Las Peñas*, Ma. Alva Q. Aberin*, Evangeline P. Bautista*, Flordeliza F. Francisco*, Len Patrick Dominic M. Garces*, Winfer C. Tabares*, Debbie Marie B. Verzosa†

Department of Mathematics, Ateneo de Manila University (ADMU)

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Abstract

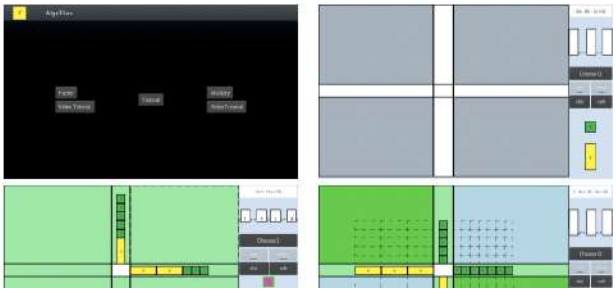
The presentation tackles mobile applications on some math topics developed as part of the DOST-PCIEERD project "Development of Interactive Software and Teaching Guides for Grade 7 to 10 Mathematics" headed by De Las Peñas [4]. The project is also involved in the construction of comprehensive resources (e.g. teaching guides, GeoGebra files) for teachers in order to help them find ways to best incorporate the apps into their respective curricula.

While the applications are primarily for Grade 7 to 10 mathematics, they can also be used to supplement discussions in college algebra and mathematical proof writing. The project features the apps named AlgeTiles [5], DrawLine [6], GeoMatch [1], and ProveIt [2], which are geared towards promoting a more interactive approach in learning and teaching basic algebraic operations, equations of a line, and proving basic geometric results on triangles and quadrilaterals. Other applications on statistics and probability created in the project are also anticipated to play a significant role in the instruction of Math in the Modern World, an upcoming math GE course.

This project recognizes the fact that mobile technology is poised as a ubiquitous way of imparting and honing mathematical knowledge. Related literature studies show the novelty of these kinds of mobile apps in mathematics.

AlgeTiles

AlgeTiles is an Android app that facilitates the learning of factoring quadratic trinomials and multipling binomials in one or two variables through the use of algebra tiles. Students and teachers are also allowed customize the given problem so that the app can be used in conjunction with classroom instruction [5].



Leorence Condes Tandog

Introducing Lesson Study to the Teachers in Southern Philippines: Foreseen Challenges

Authors Levi Elipane, Leorence Tandog

Publication date 2014

Description This paper is an elaboration of the foreseen challenges of implementing Lesson Study as a mathematics teacher professional initiative in Cotabato, a province in the Southern part of the Philippines called Mindanao. The analysis of data based on a phenomenological approach made use of the Anthropological Theory of the Didactics as an analytical tool. Through the utterances of the participants during a 5-hour intervention during a seminar workshop and their responses in interviews and survey questionnaires, it was apparent how 1) leadership; 2) teachers' mindset, and 3) affordances of the national curriculum guidelines were deemed as critical factors in being able to optimally engage in this professional development model that originated from Japan. These findings provide ramifications on how Lesson Study could be implemented by Filipino teachers.

Scholar articles Introducing Lesson Study to the Teachers in Southern Philippines: Foreseen Challenges
L ELIPANE, L TANDOG
Related articles

Pimentel, Jonald L.
Item Response Theory Modeling with Nonignorable Missing Data
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K-domination and connected K-domination in graphs

March 2016

Ferdinand Paler Jamil · Sergio Canoy Jr. · Jonald L. Pimentel · Show all 5 authors · Eveyth Deligero

Abstract

The closed neigborhood of a vertex vofa graph G is the set NG [v] consisting of v and all vertices of G adjacent to v. A set S of vertices in G is a dominating set in G if UvESNG[v] = V(G). Given a positive integer k, a subset S of G is a k-dominating set if for each vєs V(G) \ S, S contains at least k distinct vertices in the neighborhood of v. A k-dominating set S in G is a connected k-dominating set if the induced subgraph (S) of G is connected. The k-domination (resp. connected k-domination) number of G is minimum cardinality of a k-dominating (resp. connected k-dominating) set in G. Under certain conditions, for integers k, m and n with k ≤ m ≤ n, there exists a connected graph G such that m and n are the k-domination number and the connected k-domination number of G, respectively. In this paper, we also investigate the k-domination numbers and the connected k-domination numbers of the join, and the composition of a connected graph G into the complete graph Km.

Layer Groups of Batak Weaves

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[b]Department of Mathematics and Statistics, University of Southern Mindanao, Kabacan, Cotabato, 9407, Philippines

Abstract. This paper discusses the symmetry structures of the decorative weave patterns in baskets and other household items of the Batak, an indigenous community in the Philippines. The study confirms the realization of 15 layer groups that occur as symmetry groups of the Batak weaves. Layers groups are crystallographic space groups that have translational symmetries in two dimensions.

Keywords: Baskets; Batak basketry; symmetry groups; layer groups

Learning to solve addition and subtraction word problems in English as an imported language

February 2013 · Educational Studies in Mathematics 82(2)
DOI: 10.1007/s10649-012-9420-z

Debbie Verzosa · Joanne Mulligan

Abstract

This paper reports an intervention phase of a design study aimed to assist second-grade Filipino children in solving addition word problems in English, a language they primarily encounter only in school. With Filipino as the medium of instruction, an out-of-school pedagogical intervention providing linguistic and representational scaffolds was implemented with 17 children. Pre-intervention, children experienced linguistic difficulties and were limited to conceptualising and solving simple additive structures. Post-intervention interviews revealed improved performance and understanding of more complex structures, but only when linguistic difficulties were minimised. The study identified socially and culturally driven barriers to learning: superficial strategies, children's engagement, and learning in an urban poor context.

Local Attitudes and Sightings of Crocodiles in Ligawasan Marsh and its Tributaries: a Survey

JONALD L. PIMENTEL[1], CAYETANO C. POMARES[2]
AND
JOHN ARIES G. TABORA[3]

ABSTRACT

The study of crocodiles in the Philippines focuses on the two species that are present in the area, *Crocodylus mindorensis* Schmidt, also known as the Philippine Crocodile and *Crocodylus porosus* Schneider, the Indopacific Crocodile. *Crocodylus porosus* is common in the crocodile industry for its meat and skin and the species is not only widespread in the Philippines but also in other areas of the Asia-Pacific rim. On the other hand, *C. mindorensis* is endemic in the Philippines, and it is believed that its number is decreasing due to the destruction of its natural habitat and being captured as pets or food. Further the actual number of these crocodiles in the wild is unknown. Ortega (1998) states that less than 100 individuals survive in the wild. This number is commonly quoted and has never been challenged. Ross and Alcala (1983) estimated the wild population at 500 to 1000 individuals and acknowledged that this guessed at populations in some areas not surveyed (then or now), such as Samar Island and the Ligawasan Marsh.

There are claims of their presence in some areas in the wild but these reports are mostly unverified. In Mindanao, *Crocodylus mindorensis* are mostly found in Ligawasan marsh and its tributary rivers although baseline information about their presence is limited due to the location and the political situation of the area. This paper aims to present a survey of the situation of these crocodiles based on the actual sightings of people who are resident in the area and comment on their attitude towards the crocodiles.

International Conferences e-Society 2023 and Mobile Learning 2023

MATHEMATICAL MOBILE APPS VIA RURAL CASTING

Ma. Louise Antonette N. De Las Peñas[1], John Chris T. Kwong[1,2], Peter Antonio B. Banzon[2], Philip A. Martinez[1,2], Wilbur Isaac G. Lapada[2], Julian N. Eballa III[2], John Emil C. Sebastian[2], Miguel D. Asido[2], Jan Daryl M. San Juan[2], Debbie Marie B. Verzosa[3], Jumela F. Sarmiento[1], Agnes D. Garciano[1], Mark Anthony C. Tolentino[1], Maria Alva Q. Aberin[1] and Juan Carlo F. Mallari[1]

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ABSTRACT

This paper discusses the distribution, through a digital datacasting framework, of mathematical resources for Grades 1 to 7 to two schools in a community in the Philippines. Among the mathematical resources made available, are mathematical applications (apps), which run on mobile technologies, that have been created to help in the mathematical learning of students in a remote setting. The distribution is facilitated by the RuralCasting set-top box, a developed custom set-top box capable of receiving digital TV broadcasts and providing local content access through its Wi-Fi network. This paper presents the performance of the set-top box in distributing the mobile mathematical apps, and a short discussion on the mathematical applications deployed.

KEYWORDS

Mobile Technology in Teaching Mathematics, Datacasting, Mathematical Apps

Modeling Nonignorable Missing Data in Speeded Tests

November 2008 · Educational and Psychological Mea... 68(6):907-922
DOI: 10.1177/0013164408315262

Cees Glas · Jonald L. Pimentel

Abstract

In tests with time limits, items at the end are often not reached. Usually, the pattern of missing responses depends on the ability level of the respondents; therefore, missing data are not ignorable in statistical inference. This study models data using a combination of two item response theory (IRT) models: one for the observed response data and one for the missing data indicator. The missing data indicator is modeled using a sequential model with linear restrictions on the item parameters. The models are connected by the assumption that the respondents' latent proficiency parameters have a joint multivariate normal distribution. Model parameters are estimated by maximum marginal likelihood. Simulations show that treating missing data as ignorable can lead to considerable bias in parameter estimates. Including an IRT model for the missing data indicator removes this bias. The method is illustrated with data from an intelligence test with a time limit.

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More on Perfect Roman Domination in Graphs

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Abstract. A *perfect Roman dominating function* on a graph $G = (V(G), E(G))$ is a function $f : V(G) \to \{0, 1, 2\}$ for which each $u \in V(G)$ with $f(u) = 0$ is adjacent to exactly one vertex $v \in V(G)$ with $f(v) = 2$. The *weight* of a perfect Roman dominating function f is the value $\omega_G(f) = \sum_{v \in V(G)} f(v)$. The *perfect Roman domination number* of G is the minimum weight of a perfect Roman dominating function on G. In this paper, we study the perfect Roman domination numbers of graphs under some binary operations.

2020 Mathematics Subject Classifications: 05C22, 05C69,05C76

Key Words and Phrases: Roman dominating function, perfect Roman dominating function, Roman domination number, perfect Roman domination number

Navigating around marginalizing complexities: the case of mathematics teachers in the Philippines

April 2024 · ZDM: the international journal on m... 56(3)
DOI: 10.1007/s11858-024-01571-1

Catherine P. Vistro-Yu · Debbie Verzosa

Abstract

Marginalization, widely associated with poverty, inequality, and underdevelopment restricts access to resources, limits freedom of choice, inhibits the development of individual capabilities, and makes it challenging to escape from marginalized circumstances. We examine marginality in mathematics teaching and its complexities in the tightly centralized educational system in the Philippines by identifying the different situations that contribute to how mathematics teachers can be excluded from certain educational practices that would normally fall within their mandate as professional teachers. Adopting Gatzweiler and Baumüller's (Marginality: Addressing the nexus of poverty, exclusion and ecology, Springer:27–40, 2014) framework, we interviewed 15 mathematics teachers from different geographical locations around the country. We identified and organized the drivers of marginality into biophysical and societal causal clusters that enable or constrain teachers to act as professionals. Biophysical causal clusters include mathematics curriculum and mathematics assessments among others while societal causal clusters include various directives, interpretations, and realities surrounding the biophysical causal clusters. Discussions about the complexities brought about by these clusters and how teachers act or respond as they navigate around them are highlighted. Recommendations for concrete de-marginalization actions are offered.

https://doi.org/10.1038/s44185-025-00089-3

Reply to Pitogo et al.: No single silver bullet to simply understand war-biodiversity conflict in the Philippines

Check for updates

Krizler Cejuela. Tanalgo[1,2] ✉, Bona Abigail Hilario-Husain[1,2], Sarrah Jane C. Guerrero[3], Francisco Gil N. Garcia[4], Tessie E. Lerios[2], May Eva Z. Garcia[2], Renee Jane Alvaro-Ele[1,2], Meriam Manampan-Rubio[1,2], Sedra A. Murray[1,2], Lothy F. Casim[2,5], Jamaica L. Delos Reyes[2], Kier Celestial. Dela Cruz[1,2], Sumaira S. Abdullah[1,2], Shiela Mae P. Balase[1,2], Jeaneth Magelen V. Respicio[1,2], Asraf K. Lidasan[1,2], Ma. Teodora N. Cabasan[2,6], Jonald L. Pimentel[7], Florie Jane M. Tamon[8], Angelo Rellama Agduma[1,2] & Alice C. Hughes[9]

Sociopolitical conflicts have significant but often overlooked impacts on biodiversity. In our reply, we reaffirm key findings from our previous work and directly address the *Matters Arising* raised by Pitogo and colleagues. Additionally, we present fine-scale analyses that further support our original conclusions. We emphasise the need for continued research to fully unravel the complex relationship between conflict and environmental impacts.

In Hilario-Husain et al.[1], we explored the potential link between sociopolitical conflict and biodiversity knowledge shortfalls in Mindanao in the Southern Philippines using publicly available datasets on conflict and biodiversity records. We found that species occurrence records were related to the frequency and distance of conflicts at the provincial scale. We argue that security risks, logistical challenges, and political restrictions associated with conflict zones often deter biodiversity research, leading to underdocumented regions despite their ecological significance. Our study provides an initial discussion highlighting that sociopolitical and environmental conflicts represent an underestimated threat to biodiversity in the Philippines and suggests potential solutions to address them. In response to our work, Pitogo and colleagues raised some interesting concerns, specifically regarding the choice of dataset analysed and our analytical decisions. While they acknowledge the significance of our work, they suggest that it is premature and warrants reconsideration. We welcome their interest in our work and are open to their criticisms. The impressive number of authors from diverse academic institutions, including those from the Philippines, China, Taiwan, and the United States, who showed interest in our study, indicates the significance of this issue.

First, we would like to clarify that our work neither claims to investigate nor hypothesizes the direct effect of sociopolitical conflict on species richness per se (i.e., increasing conflict decreases levels of biodiversity) or on biodiversity as a whole, but our approach was exploratory, aimed at providing a basis for understanding the link between sociopolitical conflict and biodiversity knowledge shortfalls[2]. We frame biodiversity shortfalls by focusing on gaps in our understanding of species distribution, especially in geographic areas with limited or no data, and on knowledge accessibility gaps caused by challenges in accessing or sharing data due to conflict and war. We reiterate our overarching goals, acknowledge the preliminary nature of our study, and recognise the inherent caveats in pioneering research that lacks prior empirical groundwork[1]. Thus, the interpretation of our initial results requires care and caution. However, we believe that Pitogo and colleagues may have overlooked our objectives and chosen analyses, which could have led to a misunderstanding of the message we aim to convey.

Psychological Test and Assessment Modeling, Volume 57, 2015 (4), 523-541

Nonignorable data in IRT models: Polytomous responses and response propensity models with covariates

C. A. W. Glas[1], *J. L. Pimentel*[2] *& S. M. A. Lamers*[3]

Abstract

Missing data usually present special problems for statistical analyses, especially when the data are not missing at random, that is, when the ignorability principle defined by Rubin (1976) does not hold. Recently, a substantial number of articles have been published on model-based procedures to handle nonignorable missing data due to item nonresponse (Holman & Glas, 2005; Glas & Pimentel, 2008; Rose, von Davier & Xu, 2010; Pohl, Gräfe & Rose, 2014). In this approach, an item response theory (IRT) model for the observed data is estimated concurrently with an IRT model for the propensity of the missing data.

The present article elaborates on this approach in two directions. Firstly, the preceding articles only consider dichotomously scored items; in the present article it is shown that the approach equally works for polytomously scored items. Secondly, it is shown that the methods can be generalized to allow for covariates in the model for the missing data. Simulation studies are presented to illustrate the efficiency of the proposed methods.

Keywords: item response theory, latent traits, missing data, nonignorable missing data, observed covariates

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$\mu_{mn}S_p$-Open Sets in Bigeneralized Topological Spaces

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Abstract

In this paper, we introduce and characterize the notion of $\mu_{mn}S_p$-Open Sets, $\mu_{mn}S_p$-interior, and $\mu_{mn}S_p$-closure of a set in Bigeneralized Topological Spaces.

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Overview of priorities, threats, and challenges to biodiversity conservation in the southern Philippines

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ARTICLE INFO

Keywords:
Biodiversity conservation
Tree cover loss
Mindanao
Terrestrial vertebrates
Endemic and threatened species

ABSTRACT

Human activities have severely impacted many species and ecosystems. Thus, understanding the local biodiversity situation is crucial for implementing effective biodiversity conservation interventions. Mindanao in the southern Philippines is home to various unique species, particularly in its pristine ecosystems. However, the available biodiversity data for many terrestrial vertebrates and key areas remain incomplete. To address this issue, we synthesized published literature related to biodiversity from 2000 to 2022 in Mindanao. Moreover, this analysis used four key terrestrial vertebrates (amphibians, reptiles, birds, and mammals) in Mindanao as research objects. According to our findings, there was a significant and positive correlation between the number of biodiversity studies and species recorded. In terms of species richness, birds were the most recorded group (n = 334 spp.), followed by reptiles (n = 108 spp.), mammals (n = 70 spp.), and amphibians (n = 52 spp.). We also found that the number of endemic and threatened species varies geographically and across taxonomic groups. Yet, we discovered a significant disparity in the information available on biodiversity in different provinces of Mindanao. For example, the western provinces of Mindanao have had not records of biodiversity for more than two decades. Furthermore, we found that the changes in tree cover loss were consistent with biodiversity records, but this correlation is only significant for birds. Finally, we highlighted some critical threats and challenges to biodiversity, including deforestation, agricultural expansion, mining, and their impact on biodiversity conservation in Mindanao. Our findings suggested that biodiversity

PRACTICE THROUGH PLAY USING MOBILE TECHNOLOGY

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ABSTRACT

This paper discusses the *Just Keep Solving* apps that are designed based on deliberate practice model for developing mathematical skills. Features of deliberate practice include well-defined goals involving areas of weakness as determined by a knowledgeable other such as a teacher. The integration of game design features provides a positive environment wherein the learning goals critical in a deliberate practice model are emphasized. Possible strategies for integrating the apps in a classroom are also discussed using Hughes, Thomas and Scharber's RAT (Replacement, Amplification, Transformation) framework. The games can replace traditional pen-and-paper classroom activities, amplify learning by personalizing a student's experience and providing opportunities for deliberate practice, and transform instruction from being teacher-centered to student-centered.

KEYWORDS

Mobile Technology in Teaching Mathematics, Mathematical Apps, Drill-and-Practice

Pre-service elementary teachers' reasoning in introducing multidigit subtraction

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51(3):1-17
DOI: 10.1080/0020739X.2019.1647573

Debbie Verzosa

Abstract

Ideally, mathematical concepts must be justified rather than simply stated. This study examined the reasoning expressed by pre-service elementary teachers when asked to describe how they would introduce the concept of multidigit subtraction to their students. The sample consisted of 230 pre-service elementary teachers from six Philippine universities located in various regions of the country. The reasoning in each response was classified to be of high- or low-quality, on the basis of whether they were anchored to intrinsic mathematical properties. Repeating phrases were also identified and were analysed qualitatively. The findings show that more than 90% of the reasoning produced by teachers relied heavily on rules and procedures, without connections to the quantities involved in the problem. The existence of responses that were repeated across a large number of participants also suggests that the pre-service teachers' reasoning's were influenced by a 'cultural script' they learned over a lifetime of participation in rule-dominated classrooms. The paper concludes by offering recommendations and future directions.

Prospects and Challenges in Implementing a New Mathematics Curriculum in the Philippines

April 2019
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In book: Cognitive Systems and Signal Processing

Debbie Verzosa · Catherine P. Vistro-Yu

Abstract

The Philippine Department of Education recently introduced a major revamp in the curriculum, providing for an additional two years in basic education. Three provisions of this new program directly relate to mathematics education. First was the shift of language of instruction in early primary education from English to the mother tongue. Second was the development of a new mathematics curriculum that places critical thinking and problem solving as the goal of mathematics education. Third was the extended opportunities for specialization in non-academic tracks. In this chapter, we draw upon studies in the Philippines to examine the issues and concerns that need to be addressed to derive the intended outcomes of the new curriculum. We first provide an overview of curricular changes in the Philippines. Next, we discuss the prospects and warrants of the curricular changes, given that the use of English to teach mathematics has been fraught with coping strategies, and that the relevance of school mathematics has repeatedly been questioned. Finally, we argue that achieving the intended goals is not simple, particularly in resource-poor classrooms where mathematical learning is often viewed as the ability to imitate procedures set forth by the teacher or text. In a developing country like the Philippines, there is a particular need to acknowledge the constraints within the working environment where reforms will take place. A curriculum that offers some prospects for improving mathematics education can only succeed if it follows

Reading the World with Calculus

April 2015 · PRIMUS 25(4)
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Debbie Verzosa

Abstract

It is now increasingly recognized that mathematics is not a neutral value-free subject. Rather, mathematics can challenge students' taken-for-granted realities and promote action. This article describes two issues, namely deforestation and income inequality. These were specifically chosen because they can be related to a range of calculus concepts including rates of change, optimization, Riemann sums, the Fundamental Theorem of Calculus, and partial derivatives. The aim is to give ideas about how an issue may be examined from different mathematical perspectives. The impact of discussing relevant issues in the calculus classroom is described through student reflections and course evaluation.

Applied Mathematical Sciences, Vol. 10, 2016, no. 8, 389 - 401
HIKARI Ltd, www.m-hikari.com
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Separation Axioms via Generalized μS_p-Open Sets *

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Abstract

In this paper, we introduce and investigate some $g\mu S_p$-separation axioms in generalized topological spaces. Using the concepts of $g\mu S_p$-open sets, the study defines and characterizes $g\mu S_p$-R_0, $g\mu S_p$-R_1, $g\mu S_p$-T_0, $g\mu S_p$-T_1, $g\mu S_p$-T_2, $g\mu S_p$-*regular* and $g\mu S_p$-*normal* spaces.

Mathematics Subject Classification: 54A05

Keywords: $g\mu S_p$-R_0, $g\mu S_p$-R_1, $g\mu S_p$-T_0, $g\mu S_p$-T_1, $g\mu S_p$-T_2, $g\mu S_p$-*regular*, $g\mu S_p$-*normal*

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http://dx.doi.org/10.12988/ijma.2015.412401

μS_p-Sets and μS_p-Functions *

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Abstract

In this paper, the concepts of μS_p-open sets, μS_p-interior and μS_p-closure of a set in the generalized topological spaces are introduced. This also investigates related concepts such as μS_p-continuous, μS_p-open and μS_p-closed functions.

Mathematics Subject Classification: 54A05

Keywords: μ-semiopen sets, μ-preopen sets, μS_p-open sets, μS_p-functions

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Some Biases in Likert Scaling Usage and its Correction

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Abstract

In this paper, common biases or errors in the construction of intervals under the Likert scaling methodology in both odd and even scales are shown. Examples of researches that uses this scales especially in survey that requires perception response from the respondents will be presented, discussed and analyzed for possible biases. Suggestions for the corrections of these biases are presented in order to minimize the bias leading for a better labeling and interpretations of the results.

Keywords: Bias; difference; even; Likert scale; odd; scoring.

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HIKARI Ltd, www.m-hikari.com
http://dx.doi.org/10.12988/ijma.2014.4389

Some Properties of rw-Sets and rw-Continuous Functions[1]

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Abstract

In this paper, the concept of regular w-closed (rw-closed) sets in topological spaces introduced in [1] is further studied. It also investigates related concepts such as rw-interior and rw-closure of a set, and rw-continuous.

Mathematics Subject Classification: 54A05

Keywords: regular open sets, rw-sets, rw-functions

Strategies in Maximizing the Use of Existing Technology in Philippine Schools

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Abstract: One of the challenges that continue to confront teachers in Philippine schools is the accessibility of technology for the study and learning of mathematics. In this paper, we will look at several situations and actual experiences happening in Philippine schools. Strategies on how existing technological tools are to be maximized will be discussed, including the creation of lesson plans and classroom activities. The use of technology-based manipulatives in mathematics learning as alternatives to unavailable technology will also be looked at.

Shih, JL. et al. (Eds.) (2023). Proceedings of the 31st International Conference on Computers in Education. Asia-Pacific Society for Computers in Education

Technological Tools for the Teaching and Learning of Statistics

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Abstract: Statistics and its applications form an integral part of STEM education. In the literature, it is shown that technology is valuable in supporting the teaching and learning of statistics. This paper discusses some technological tools that have been developed to support statistics education in the grade school, junior high school, and senior high school levels. It describes the design and pedagogical basis of these tools, and how these may be integrated in the classroom.

Keywords: Mathematical apps, statistics, STEM, technological tools in statistics

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Technology-Based Manipulatives

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Abstract: One of the challenges confronting a Philippine mathematics teacher is the unavailability/lack of technology for use in the classroom. In this paper, we present technology-based manipulatives that provide opportunities for experimentation and discovery in the mathematics classroom as alternatives to the absence of technology. Models on Euclidean geometry, analytic geometry, trigonometry, and calculus will be discussed that can be used by students to observe and make conjectures on formulas and theorems.

European Institute of Knowledge & Innovation

Journal of Effective Teaching Methods (JETM)
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Research Article

The Application of Enhanced Damath in Learning Operations on Integers and Developing Strategic Thinking

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Abstract: This study examined the effect of using enhanced Damath on learning integer operations and developing strategic thinking. Enhanced Damath is an educational board game which is a Philippine traditional Damath game with a dice modifier. Damath has been used in Philippine schools mainly to improve students' mathematical competency in computing. This research aimed to expand the application of Damath to improve strategic thinking which naturally develops in game playing. A randomized pretest-posttest control group experimental research design with matched subjects was used to gather empirical evidence. The respondents for the experimental group were randomly chosen high school students. The respondents for the control group were randomly chosen matched pairs of the subjects in the experimental group determined based on the school enrolled, grade level, academic performance, sex, and age. Results revealed that playing enhanced Damath significantly improves students' level of knowledge in integers involving single and multiple operations. The game also significantly contributes to the development of students' strategic thinking. Students affirmed the positive effect of enhanced Damath in terms of improved performance and a fun way to learn mathematical skills.

Keywords: Damath; enhanced Damath; integer operations; strategic thinking; experiment

The Effect of Classical Music on Spatial Intelligence

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Abstract

The present study was to examine the effect of classical music on the spatial intelligence in college students. Standard Progressive Matrices (SPM), a 60-item spatial intelligence test was employed to measure the level of spatial intelligence. There were two groups — 20 participants in each group ages 16-18 which were observed during the study. The experiment consisted two sessions. On the first session, both groups were exposed, in ten minutes, into silence and answered the SPM after the exposure. On the other hand, on the second session, one group was still exposed, in ten minutes, into silence and the other group was exposed, in the same duration of time, into classical music. They answered the same test just after the exposure to the said conditions. Results showed that classical music has a highly significant effect on the level of spatial intelligence of the participants.

Keywords: Classical Music, Spatial Intelligence

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The Effect of Retention Interval Over a Three Year Period on the Elementary Algebra Performance of High School Students

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Abstract

This study provided empirical evidence on the effect of retention interval on the student's performance in elementary algebra mathematics among High School Students. The subjects were the grade 8, grade 9 and grade 10 students of the University Laboratory School, University of Southern Mindanao, Philippines for school year 2012-2013 who took their elementary algebra in their grade 7 in the school under the same instructor. The results of the respondents' grade 7 exam taken prior to the conduct of study was the initial test were used for comparison to their present retest result. Results revealed that there was a highly significant difference between the achievement during and after instruction of the participants according to their year level. Gain in performance across retention interval group were highly significant. Retention interval supplemented enough time for the students to practice what was previously learned as they engaged to new but highly related mathematics courses. Further, exposure to different academic trials facilitated development of expertise and mathematical academic maturity on the students contributed to the increase in gain with increasing retention interval. Thus, retention interval was found to be advantageous in mathematics if practiced and elaborated.

Keywords: achievement; after instruction; during instruction; gain score; test; retest; retention interval.

THE EFFECT OF POSITIVE REINFORCEMENT ON CLASS PARTICIPATION AMONG PRESCHOOLERS

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Abstract

A study was conducted to determine the effect of positive reinforcement on class participation among preschoolers particularly to investigate if positive reinforcement can increase class participation among preschoolers. Forty eight (48) preschoolers of Kabacan Pilot Central School were subjected for the experiment using five evaluation forms namely the Daily log, Instructional Schedule Matrix, Rating scale, Task analysis data collection sheet and lastly Behavior log. Tally sheets for the days of observation were also employed. The evaluation forms were answered by the class teacher and were retrieved right away. Result of the study shows that positive reinforcement has a highly positive significant effect on the class participation of preschoolers and that positive reinforcement regardless of its forms has significantly improved and increased the preschooler's participation in classroom activities.

Keywords: class participation, positive reinforcement

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

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ABSTRACT

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

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

Using dynamic tools to develop an understanding of the fundamental ideas of calculus

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DOI: 10.1080/0020739X.2013.790513

Debbie Verzosa · Angela Fatima Guzon · Ma. Louise Antonette Navarro De Las Peñas

Abstract

Although dynamic geometry software has been extensively used for teaching calculus concepts, few studies have documented how these dynamic tools may be used for teaching the rigorous foundations of the calculus. In this paper, we describe lesson sequences utilizing dynamic tools for teaching the epsilon-delta definition of the limit and the fundamental theorem of calculus. The lessons were designed on the basis of observed student difficulties and the existing scholarly literature. We show how a combination of dynamic tools and guide questions allows students to construct their understanding of these calculus ideas.

USING MOBILE TECHNOLOGY TO PROMOTE HIGHER-ORDER THINKING SKILLS IN ELEMENTARY MATHEMATICS

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ABSTRACT

The problem of rote-based learning in mathematics is well documented. Mobile technology can provide a potential solution, especially when application (app) design is based on sound pedagogical principles and gamification elements. However, an inventory of available mobile apps for mathematics reveals that many of the available apps are guided by a behaviorist perspective that favors repetition over meaningful learning. This paper reports on the design of mobile mathematics apps that harness gamification techniques to promote higher-order thinking skills (HOTS) even in basic elementary school concepts such as number comparison, and addition and subtraction. The integration of these apps in the classroom is also discussed.

KEYWORDS

mobile technology in teaching mathematics, mobile learning, numeracy apps, higher-order thinking skills, HOTS

swer?" "Show me how to get your answer and tell me what you are thinking as you do it." "Write down your answer." "Tell me how you think you could check whether your answer is correct?"

Using Word Problem Solving Prompts to support NESB students

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Joanne Mulligan
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In this article Debbie Verzosa and Joanne Mulligan suggest a new approach to addressing the difficulties that NESB students encounter when solving word problems.

Many young children may find it difficult to solve mathematical word problems even if they are capable of carrying out the necessary operations required by the problem. It is common even for children whose first language is English to be impeded by the linguistic demands of a problem (Perso, 2009). Children who can untangle the linguistic complexity of a problem may still fail if they cannot apply their mathematical knowledge to the problem situation. In this article, we propose a new approach to scaffold- its use is limited if a child is in the early stages of learning English. This is the case for many children in Australia, such as Indigenous children in remote communities or recent immigrant children who have yet to experience schooling in English. Children learning a second language may be expected to go through five stages of language acquisition (Krashen & Terell, 1983; see Table 1), so it is crucial to give questions or prompts that are appropriate for their stage (Hill & Björk, 2008).

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Vertex-Weighted (k_1, k_2) E-Torsion Graph of Quasi Self-Dual Codes

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Abstract. In this paper, we have introduced a graph G_{EC} generated by type-(k_1, k_2) E-codes which is (k_1, k_2) E-torsion graph. The binary codewords of the torsion code of C are the set of vertices, and the edges are defined using the construction of E-codes. Moreover, we characterized the graph obtained when $k_1 = 0$ and $k_2 = 0$ and calculated the degrees of every vertex and the number of edges of G_{EC}. Moreover, we presented necessary and sufficient conditions for a vertex to be in the center of a graph given the property of the codeword corresponding to the vertex. Finally, we represent every quasi self-dual codes of short length by defining the vertex-weighted (k_1, k_2) E-torsion graph, where the weight of every vertex is the weight of the codeword corresponding to the vertex.

2020 Mathematics Subject Classifications: 05C25, 05C60, 05C62, 05C90, 11H71, 14G50

Key Words and Phrases: quasi-self dual codes, rings, torsion codes, E-codes, E-torsion graphs, graph representation, quasi-self dual codes

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Education in Southeast Asia
2009, Vol. 32 No. 2, 131-160

Young Filipino Students Making Sense of Arithmetic Word Problems in English

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Young Filipino children are expected to solve mathematical word problems in English, a task which they typically encounter only in schools. In this exploratory study, task-based interviews were conducted with seven Filipino children from a public school. The children were asked to read and solve addition and subtraction word problems in English or Filipino. Analysis focused on how language influences problem solution, and on the reading and mathematical strategies used. Results showed that children (a) were better able to comprehend and solve problems given in Filipino, (b) rarely used reading strategies, (c) were not familiar with using drawings or objects to represent word problems, and (d) employed unitary counting procedures for problems involving multi-digit numbers.

Key words: Word problems; English language learners; Reading comprehension