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Understanding Insights of Math Repeaters in a State University: A Qualitative Case Analysis

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Abstract

While the practical usefulness of Mathematics is undeniable, it unfortunately stands as one of the least appreciated disciplines. Even within educational settings, a significant number of students harbor an aversion towards this subject. This sentiment was vividly highlighted in the 2018 Programme for International Student Assessment (PISA), where the mathematical proficiency of Filipino learners fell below the average score of 79 when compared to their counterparts from 79 participating countries in the Organization for Economic Co-operation and Development (OECD). Grounded in the Attention-Relevance-Confidence-Satisfaction (ARCS) model and the Self-determination theory, this qualitative case study aimed to understand the insights of math repeaters within a state university in the province of Leyte, Philippines. Data were obtained through in-depth interviews, observation, and focus group discussion of 6 purposively selected students from one department in a state university. Using thematic analysis, two themes emerged namely the different challenges faced by math repeaters and their educational journey and support. The identified challenges encompassed a spectrum of issues, ranging from personal conflicts to academic struggles, along with difficulties in time management, test-taking situations, and struggling with specific mathematical concepts. Furthermore, the study emphasized the significance of an engaging educational environment, effective pedagogical strategies, and the tenacity of personal commitment in attaining academic accomplishments. Guided by these findings, the study advocates for a proactive stance within educational institutions, urging a concerted effort to bolster the support mechanisms available to math repeaters. By cultivating an environment that embraces their challenges and facilitates holistic learning experiences, educational institutions can catalyze the transformation of math repeaters into resilient learners capable of remarkable academic accomplishments.

Keywords: *ARCS model; Self-determination theory; Filipino students, Case study*

1. Introduction

Mathematics stands as a prominent subject within the educational system of the Philippines, with its instruction spanning from early childhood to postgraduate levels. Mathematical skills exhibit a developmental trajectory, maturing as individuals progress through different life stages. The significance of mathematical skills for cultivating a reputable career and enhancing productivity has been underscored by Vorderman et al. (2011). Additionally, these skills foster a range of proficiencies essential for problem-solving, judgment-making, and navigating the intricacies of daily existence, as noted by English and Gainsburg (2015). Whether consciously or unconsciously, Mathematics finds application in everyday activities, extending its presence even to the natural world. It is evident in leaf

arrangements, the intricate packing of seeds within sunflowers, the reproductive patterns of rabbits, the shell structures of snails, and notably, the routines of human endeavors. Despite the intrinsic elegance of Mathematics in the human environment, it is clear that some individuals, particularly students, fail to recognize its essence and practicality. This sentiment aligns with the findings of Zan and Martino (2008), revealing that students exhibit a preference for the mathematics subject when they are capable of comprehending and solving its challenges; conversely, they display aversion when confronted with difficulties beyond their abilities. In essence, students' affinity for Mathematics is intertwined with their sense of contentment and enjoyment in engaging with the subject matter. Myers' investigation (1992), cited in Can et al. (2017), further supports this connection by demonstrating that happy students exhibit adept problem-solving skills, achieve greater success, and deliver improved work performance. Furthermore, Nadler, Rabi, and Minda (2010) contend that happiness fosters cognitive flexibility in problem-solving processes.

Furthermore, Smith (2010) illustrated that students who experienced discontentment were more inclined to terminate their engagement in mathematics education. Similarly, Raterink (2002) unveiled that contentment emerged as a pivotal determinant of students' achievements. Contentment instills a favorable outlook and amplifies students' motivation towards the acquisition of mathematical knowledge. Nicolaidou and Philippou (2003) accentuated that students initially exhibit positive attitudes toward mathematics upon commencing school, but these attitudes tend to deteriorate during the high school years. Moreover, Howard and Whitaker (2011) also affirmed that students lacking motivation manifest reduced participation in class activities, diminished involvement in discussions or volunteering responses, thereby leading to suboptimal performance in standardized assessments.

In the United States, Scarpello (2007) documented that a significant majority of Americans, accounting for seventy-five percent (75%), discontinue their pursuit of mathematics and veer away from numerous mathematics-related career paths. One of the primary contributing factors identified by Scarpello was the presence of mathematics anxiety. This apprehension towards mathematics begins to take root during the early educational stages, particularly at an intermediate level, where some students exhibit unfavorable emotional responses when confronted with situations involving numbers, symbols, and calculations. However, Gafoor and Kurukkan (2015) contended that various factors, encompassing both cognitive and affective dimensions, shape students' learning experiences. These factors comprise personal attributes, peer interactions, familial dynamics, school environment, and the inherent nature of the subject itself. Maat and Zakaria (2010) affirmed that students' perceptions of their teachers significantly impact their attitudes. Additionally, Malmivuori (2008) posited that students may harbor pessimistic perspectives toward mathematics due to the perceived difficulty and abstract nature inherent to the subject matter.

Furthermore, Samuelsson and Granstrom (2007) asserted that an unsupportive classroom environment contributes to students' aversion to Mathematics education. Conversely, when students perceive the learning milieu as encouraging and positive, the likelihood of fostering favorable attitudes increases (Mata, Monteiro, & Peixoto, 2012). Additionally, Akey (2006) underscored that students' negative perception of Mathematics often stems from a lack of teacher support. The dearth of teacher support, along with a range of factors such as perceived difficulties, low self-efficacy, disinterest, monotony, negative beliefs, and diminished task value, contributes to students' limited participation in mathematics (Brown, Brown, & Bibby, 2008). Notably, educators must consider the diverse learning needs of students, particularly those with learning disabilities or those at risk of mathematical

difficulties, as they confront substantial challenges in comprehending, retaining, and demonstrating profound understanding of varied mathematical concepts (Cortiella & Horowitz, 2014). To this end, effective strategies must be employed by teachers to motivate students in learning mathematics, irrespective of their challenges. An avenue for enhancing students' affinity for the subject lies in bolstering their affective beliefs, a pedagogical approach that educators can implement (Gafoor & Kurukkan, 2015). Moreover, Chohan and Qadir (2006) highlighted that grade retention often surfaces as a prevalent solution for addressing poor academic performance within educational systems. They posit that grade retention primarily aims to assist underperforming students by providing them with the necessary time to enhance their academic abilities and competencies.

Despite the multitude of research endeavors aimed at exploring diverse student learning encounters in relation to the field of Mathematics, a significant portion of these investigations has been undertaken in Western nations. Additionally, within the Philippine context, a majority of these inquiries have predominantly adopted quantitative methodologies. It is worth noting that, from the researcher's awareness, only a limited number of published studies have embraced a qualitative approach. In light of this, the researcher aspires that the present study will contribute to a contextualized enrichment of insights, offering a more profound comprehension of the insights of math repeaters in learning mathematics.

1.1.Statement of the Problem

This study aimed to understand insights of math repeaters who failed in passing the Math course and were able to pass for the second time. Specifically, this study sought to answer the following questions:

1. What are insights of repeater students in learning mathematics?
2. How do math repeaters motivate themselves in learning and passing the mathematics course?

1.2. Theoretical Framework

The primary objective of this research is to comprehensively grasp the perspectives and insights of individuals who find themselves repeating the study of mathematics within a state university situated in the province of Leyte, Philippines. The theoretical underpinnings of this study are firmly grounded in the Self-determination theory and the Attention-Relevance-Confidence-Satisfaction (ARCS) model. Self-determination theory, as expounded by Ryan and Deci (2000), focuses on investigating and analyzing the motivational factors that influence an individual. This theory underscores the notion that people attain self-understanding through the integration of novel experiences and interpersonal connections, a process facilitated by the fulfillment of their needs, desires, and interests. A distinct facet of the Self-Determination theory is its differentiation between intrinsic and extrinsic motivations, as delineated by Nguyen and Goodin (2016). Intrinsic motivation stems from personal gratification derived from engaging with a subject, such as a student finding contentment in solving mathematical problems. Conversely, extrinsic motivation is driven by external or societal incentives, exemplified by parental praise or monetary rewards for achieving high grades. Furthermore, the ARCS model, advanced by Keller (2009), reinforces the foundation of this study. According to Keller, the ARCS model accentuates students' attention, the relevance of instructional content aligned with their learning preferences, their confidence in attaining successful outcomes, and their satisfaction levels derived from the learning

experience. These components directly correlate with students' motivational aspects and their pursuit of effective learning.

2. Methodology

2.1. Research Design

This study employed a case study design to understand insights of students who have repeated enrolling in a math course and were able to pass. A case study is an appropriate qualitative research design in utilizing in-depth analysis of a restricted entity, namely the place, the event, or the person (Stacks, 2005). According to Omair (2015), a descriptive single case study design is characterized by its focus on delineating the fundamental attributes inherent in the representative sample utilized within the study.

2.2. Research Participants

Drawing support from Gerring's (2007) assertion that case study research frequently involves a case count of fewer than 12 participants, or even a singular case, the determination of the number of participants for this study is informed by such guidance. The selection of six participants was carried out in accordance with specific criteria: (1) Enrollment in a public tertiary educational institution in the province of Leyte, Philippines; (2) Attainment of a grade of 5.0, DRP (Dropped), or N.A. (Not Available) in any mathematics courses during the academic years 2015 – 2016 to 2017 – 2018; (3) Successful completion of the previously failed mathematics course upon retaking it within the years 2015 to 2017; and (4) Willingness to volunteer for participation and complete the consent form in its entirety.

2.3. Data Gathering Procedure

Data collection transpired in two distinct phases: The initial phase encompassed in-depth individual interviews with the participants. Prior to commencing data collection, the researcher distributed an informed consent form to prospective student participants, requesting their completion and submission. Subsequently, employing a semi-structured interview guide, the researcher conducted thorough interviews. Throughout these interviews, a mobile phone was utilized to record conversations with the six selected participants. The intent of these audio recordings was to facilitate subsequent transcription while ensuring the preservation of the participants' statements in their entirety. These audio records proved ample in fulfilling the researcher's objective of comprehending the perspectives of math repeaters concerning their mathematical learning experiences. Additionally, the interview process involved the note-taking of participants' responses, serving as a basis for constructing pertinent follow-up questions aimed at expounding upon and clarifying their insights (Rubin & Rubin, 2005).

The subsequent phase of the study encompassed a focus group discussion (FGD) involving the participants, aimed at corroborating the outcomes derived from individual participant interviews. This FGD stage encompassed inquiries regarding students' perceptions of Mathematics learning, their sources of motivation within the subject, and their strategies for succeeding in the context of retaking math courses.

2.4. Data Analysis

The researcher employed thematic data analysis of Braun and Clarke (2013). By embracing this method, the study was equipped to delve deeply about the insights of students who are math repeaters in learning Mathematics. Through a systematic process of research, the study adhered to the following sequence of actions: Firstly, the collected data underwent transcription, transforming it into written form for further examination. This served as the foundational step in rendering the raw data more accessible for subsequent analysis. Next, a comprehensive reading of the data was conducted to establish familiarity and an initial understanding of its contents. Following this, a coding process ensued, systematically categorizing and labeling data segments to facilitate organization and analysis. Within the coded data, patterns and recurring themes were discerned, fostering a cohesive framework for understanding the participants' insights. These emergent themes were subjected to rigorous review, ensuring their accuracy and consistency. Upon validation, each theme was meticulously defined and aptly named, serving to encapsulate its essence. Finally, the culmination of this methodical journey involved arriving at conclusive insights and interpretations drawn from the comprehensive analysis of the data.

2.5.Ethical Considerations

The researcher adhered to established protocols encompassing human rights, legal compliance, conflict of interest, as well as safety and health standards. Furthermore, the researcher individually obtained consent from the six participants, seeking permission for one-on-one interviews at their convenience and based on their willingness to partake. Moreover, proper attribution was given to all authors cited in this study, and the participants were assured of the confidentiality of their responses and personal identities.

3. Results and Discussion

Utilizing the thematic data analysis methodology elucidated by Braun and Clark (2013), the following three key themes have been formulated and interpreted within this study.

Theme 1: Different Challenges Faced by Math Repeaters

Students have experienced different challenges toward their learning in mathematics. These challenges include personal and academic conflicts, nervousness during math lessons, lack of time management, health issue while taking the test, and struggles with specific mathematical concepts.

Participant 1: *"(5.0 gyud akoa grado kay dili gyud kaya sa akoa oras, pait kaayo kung magdungan ang mga problema sa balay ug sa skwelahan) I got 5.0 because I have a problem with my time management… especially when simultaneously there are problems in family and school."*

Participant 2: "(*Basta ngani masulod na ako iton amon classroom ha math, ambot kay ginkukulba man ako dayon*) *Whenever I enter our math classroom, I don't know why I immediately got nervous."*

Participant 3: *"(working student ak sir, na timing gud na an akon time han ak klase ha math conflict ha akon gintrabahoan…) I'm a working student, sir. There's a conflict with the schedule of my math class and my work"*

Participant 4: *"(kulbaon talaga ako kun math na… maupay man natutdo an amon teacher, ha akon gud la eni kalugaringon kay ginpangunahan ak kulba hilabi na kun mayda ipapa answer an am sir) I got nervous whenever it is math time… our teacher is good, it's in myself that I immediately got nervous especially when our sir has an activity to be answered"*

Participant 5: *"(Maupay ko man adto amon math class, sir. Maupay man gihap natutdo amon teacher pero kun napa exam na ngani hiya, nakukurian man ak pag-answer hilabi na han time na nagkasakit ako) "Our math class is good. Our teacher is also good but when I take the exam, I have difficulty to answer it especially when I had been sick"*

Participant 6: *"(Nukukurian ako kun mga x and y na an gin-iistoryahan, nalilipat ak kay ano na negative ngan na positive an number) I have difficulty when the discussion is all about x and y,… I got confused why the number becomes negative and positive"*

Theme 2: Educational Journey and Support

The various responses provided encapsulate a theme centered around the educational journey of students, their experiences in a math class, the role of technology in learning, the significance of teacher support, and the determination to excel academically. The responses highlight different aspects of math repeaters' educational experiences, ranging from interactive classroom activities to the use of modern teaching methods, familial support, and the drive to improve one's understanding of challenging subjects. More so, the theme underscores the importance of an engaging learning environment, effective teaching techniques, and the impact of personal dedication in achieving academic success.

Participant 1: *(Last year, nag-enjoy ko sa amoa math class kay dili me permi naa sa classroom, usahay moadto me sa gawas then naay pa station-station ang amoa sir. Unya, naay task ang amoa sir kada station, nag istorya-istorya akoa ka grupo kung unsay answer kay naay time kada station) Last year, I enjoyed my math class because we weren't always inside the classroom doing math… sometimes we went outside and we had math stations activity. Then, our teacher had prepared task for every station and I together with my groupmates were actively sharing our answer because there's time limit in every station."*

Participant 2*: (Maupay nala na millennial na an akon teacher ha math. Mahilig hiya mag-Powerpoint ngan klarado talaga hiya na discuss… ginkikinitaan ko iya PPT while hiya na discuss ngan nabaro man ak) It's good that my math teacher is millennial. He was fond of using PowerPoint presentation and he clearly discussed the lesson… I learned his lesson while looking at his PPT and listening to him"*

Participant 3: *(Ha yana, an akon auntie na an napa eskwela ha ak. Naniguro na ako ha ak pag-eskwela, waray la anay ako pag-sideline as working student) For now, my aunt supported my study. I made sure that I continued my education, so I didn't have any part-time job as a working student for a while.*

Participant 4: *(Han gin retake ko na an math, medyo nakaka-answer na ako kay na familiar ko na an mga terms na ginyayakan ha am teacher… na excite ako danay kun nakaka answer ako hin sakto) "Since I took again the math subject, I've been able to answer some questions because I'm already familiar with the concepts that the teacher discussed… I'm quite excited whenever I can provide accurate answers."*

Participant 5: *"(Marisyo, diri boring an am klase ha math kay mayda pakulo an am teacher) Our math class is not boring because our teacher has interesting activities."*

Participant 6: *(Nag-aram na ak hin maupay sir kay bangin ak diri maka-graduate… Para ak mabaro pa, nagkinita ak ha youtube kay klaro an pagka-discuss ngadto…) I studied well, sir, because I'm afraid not to graduate here... To understand better, I watched on YouTube because the explanation there was clear...*

4. Conclusion and Recommendation

In the endeavor to grasp the insights of math repeaters within a state university in Leyte, Philippines, this research delved into the Self-Determination Theory and ARCS Model as foundational frameworks. The narratives of the six participants provided profound insights into the array of challenges encountered by these students within their mathematics education. These challenges encompassed a wide spectrum, spanning personal conflicts, academic hurdles, issues with time management, test-taking situations, and struggles with specific mathematical concepts. Additionally, a recurring theme emerged, underscoring the pivotal role of an immersive educational environment, adept pedagogical strategies, and unwavering personal determination in achieving academic success.

In light of these findings, it is recommended that educational institutions adopt a proactive stance to offer comprehensive support to math repeaters, ultimately elevating their learning experiences. Effectively addressing the identified challenges necessitates a holistic approach. In this context, institutions can facilitate workshops focusing on time management, stress reduction, and efficacious study techniques, empowering students to surmount personal and academic obstacles. Furthermore, the cultivation of an interactive and supportive classroom milieu, coupled with innovative instructional approaches and seamless technology integration, can heighten students' confidence levels and deepen their comprehension. By acknowledging the multifaceted nature of challenges and harnessing the insights highlighted through this study, institutions can pave the way for the academic success and overall well-being of math repeaters throughout their educational journey.

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