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Linking Prior and New Knowledge: Perceptions of Grade 7 Students on Meaningful Mathematics Learning

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Abstract — Connecting prior and new knowledge in mathematics is a challenge. I explored meaningful learning as perceived by Grade 7 students. I utilized qualitative descriptive design and involved 14 students whom I selected via purposive sampling technique. My interviews and focus group discussions revealed that students' prior mathematical knowledge—topic, process, and principle knowledge—together with positive learning experiences, helped them overcome difficulties, connect past lessons to new concepts, and solve tasks more meaningfully. Meaningful mathematics learning may be strengthened through the combined efforts of teachers and school leaders by activating prior knowledge, using interactive real-life strategies, fostering supportive classrooms, and providing training, resources, and academic support. Future research may include Multiple Linear Regression and Exploratory Factor Analysis to better measure and understand how prior knowledge and new learning influence students' meaningful learning in mathematics and to guide more effective teaching strategies.

Keywords: Linking prior and new knowledge, perceptions of grade 7 students, meaningful mathematics learning

I. INTRODUCTION

In this chapter, I presented the problem and its scope, significance of my study, research questions, theory and theoretical lens, and my assumptions.

The Problem and Its Scope

Globally, I found that Grade 7 students have difficulty connecting what they already know with new mathematical concepts, especially in topics like algebra, fractions, and proportional reasoning. Studies show that learners often struggle to link prior knowledge with new and more abstract ideas in mathematics (Alreshidi, 2023). International assessment results also show that students find it hard to apply earlier learning to more complex math problems (Mullis et al., 2020).

In different countries, I also observed the same issue. In the United States, students struggle to connect basic arithmetic with early algebra. In Japan, learners find it difficult to use past lessons in new problem-solving situations. In South Africa, Grade 7 students have difficulty relating basic number concepts to fractions and ratios in real-life math problems (Boaler, 2022; Niss, 2021; Spaull, 2021).

In the Philippines, I learned that Grade 7 students also struggle to connect prior knowledge with new lessons in topics like integers, algebra, and geometry. Studies show that students often find it hard to integrate what they learned in elementary mathematics with new lessons in junior high school (Bernardo, 2021; Department of Education, 2022).

This difficulty in connecting prior knowledge with new mathematical concepts remains a continuing problem in Grade 7 mathematics learning. However, I found that there are still limited studies that explore this issue in detail, especially using qualitative research designs that focus on students' actual experiences and how they make sense of mathematical connections in real classroom settings. This gap highlights the need for further qualitative research that explores how students make mathematical connections in authentic classroom settings (Schoenfeld, 2016; Mullis et al., 2020). It is for this reason that this study was conducted.

Significance of the Study

This study is significant as it explores how Grade 7 students connect new mathematical information to their prior knowledge, the challenges they encounter in this process, and the strategies they employ to facilitate understanding and application. The findings may help students become more aware of their own learning processes and improve how they approach new concepts. For teachers, the results can inform more effective instructional practices, classroom activities, and remediation strategies that better support meaningful learning.

Moreover, this study aligns with the Department of Education's goal of promoting quality, learner-centered education and contributes to the realization of Sustainable Development Goal 4. It may also provide valuable insights for Holy Cross of Davao College, particularly its Graduate School and teacher education programs, in enhancing curriculum development and instructional design. Finally, this study can serve as a useful reference for future researchers aiming to further improve mathematics teaching and learning practices.

Research Questions

This study aimed to explore how Grade 7 students connect prior knowledge with new mathematical concepts by examining their existing knowledge, perceptions of mathematics learning, and how they make sense of links between previous and new lessons. Specifically, it sought to answer the following questions:

1. What are the prior knowledge of Grade 7 students on specific mathematical concepts?
2. What are the perceptions of Grade 7 students on learning new mathematical concepts? and,
3. What are the perceptions of Grade 7 students on connecting the new information to their existing knowledge about mathematical concepts?

Theoretical Lens

I anchored this study on Ausubel's Meaningful Learning Theory (1963) which posits that learning becomes meaningful when learners connect new information to their existing knowledge.

Instead of simply memorizing facts, students understand concepts better when they relate new ideas to what they already know.

Conceptual Paradigm

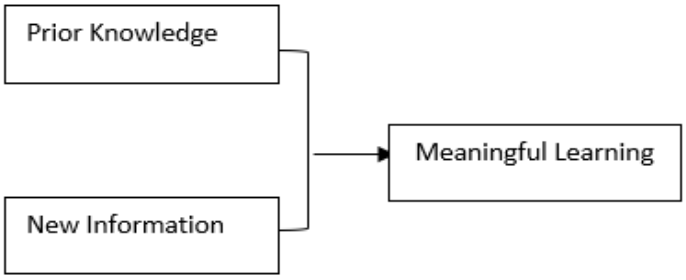

FIGURE 1
PARADIGM OF THE STUDY HIGHLIGHTING AUSUBEL'S MEANINGFUL LEARNING THEORY

Assumptions

In this study, I assumed that meaningful learning happens when students connect prior knowledge with new information. I also assumed that participants' responses will reveal important patterns in their learning experiences. Furthermore, I assumed that students would share their own learning strategies and describe the teaching strategies used by their teachers. Lastly, I assumed that students differ in their foundational skills, with some having strong basics while others have learning gaps.

II. METHODOLOGY

To establish the credibility of this study, I subsequently presented the methodological process to provide a clear account of how the research was conducted. In this section, I discussed the research design, sample and sampling technique, data gathering and analysis techniques, and trustworthiness of the study.

Research Design

In this study, I used a qualitative descriptive research design, which describes a phenomenon in a clear and simple way based on the participants' own words with minimal interpretation (Doyle et al., 2020; Kim et al., 2021). I used this design because it is helpful when the goal is to understand people's experiences and perceptions in their natural setting, especially when the topic needs direct and detailed descriptions rather than complex explanations. In this study, I applied it to understand how Grade 7 students connect new information to what they already know. This design is simple and flexible, which helped me focus closely on the students' responses and present the findings in a clear and useful way for teaching and learning. It has also been used in recent educational studies, showing that it is suitable for classroom-based research and educational settings (Creswell & Creswell, 2018; Kim et al., 2021).

Locale of the Study

I conducted this study in a public junior high school in Sasa, Davao City. I chose this school because it is accessible to me and provides a real classroom setting where Grade 7 students come from different backgrounds. This made it a suitable place to understand their actual experiences in retaining mathematical concepts. I also selected this school because its accessibility ensured practicality and feasibility in carrying out the investigation, which are important factors in choosing an appropriate study location (Creswell & Creswell, 2018). Since the school has learning conditions similar to many public schools, it also helped make the findings be more relevant and practical.

Sample and Sampling Technique

The participants of this study were Grade 7 students from a public junior high school enrolled during the school year 2025–2026, with varying levels of mathematics performance—fast, average, and slow learners. Students with irregular attendance, special instructional needs, or those who chose not to participate were excluded. The final sample included five students for in-depth interviews and nine students for focus group discussions, which provided sufficient

information to understand their experiences (Creswell & Creswell, 2018). To ensure that the selected participants could provide meaningful insights, I used purposive sampling, which is commonly used in qualitative inquiry to select participants with relevant experiences (Creswell & Creswell, 2018). This allowed me to focus on students with relevant experiences and gathered rich, detailed data.

Data Gathering Technique

To gather data for this study, I used in-depth interviews and focus group discussion, which are widely used in qualitative research to explore participants' experiences in depth (Tümen-Akyıldız & Ahmed, 2021). In-depth interviews allowed me to explore each student's personal thoughts, feelings, and experiences through one-on-one conversations conducted face-to-face and online, while focus group discussions helped me capture shared experiences and different viewpoints through group interaction. These techniques are especially useful when the goal is to gain a deeper understanding of participants' perspectives and meanings. Using both methods allowed me to gather rich, detailed data and strengthen the depth of this qualitative descriptive study.

Data Analysis Technique

For this study, I used thematic analysis to examine the data I gathered from in-depth interviews and focus group discussion. This method allowed me to systematically identify and interpret patterns, or *themes*, across participants' responses (Braun & Clarke, 2021; Kiger & Varpio, 2020). I chose thematic analysis because it is flexible, enabling me to explore participants' experiences in depth while generating rich insights. By coding the data and grouping codes into meaningful themes, I was able to highlight common perspectives and important variations in their experiences, which directly helped answer my research questions.

Trustworthiness of the Study

To ensure trustworthiness, I followed Lincoln and Guba's (1985) framework by using strategies that enhanced credibility, transferability, dependability, and confirmability. This includes prolonged engagement, multiple data sources (interviews and focus group discussions), member checking, detailed contextual descriptions, systematic documentation, and reflexive journaling to reduce bias. Ethical clearance was secured from SMILE, DepEd, and the participating school, which served as the site of data collection, ensuring the protection of participants' rights and well-being throughout the study.

III. RESULTS AND DISCUSSIONS

In this section, I discussed the findings of my study, future direction and implication for practice.

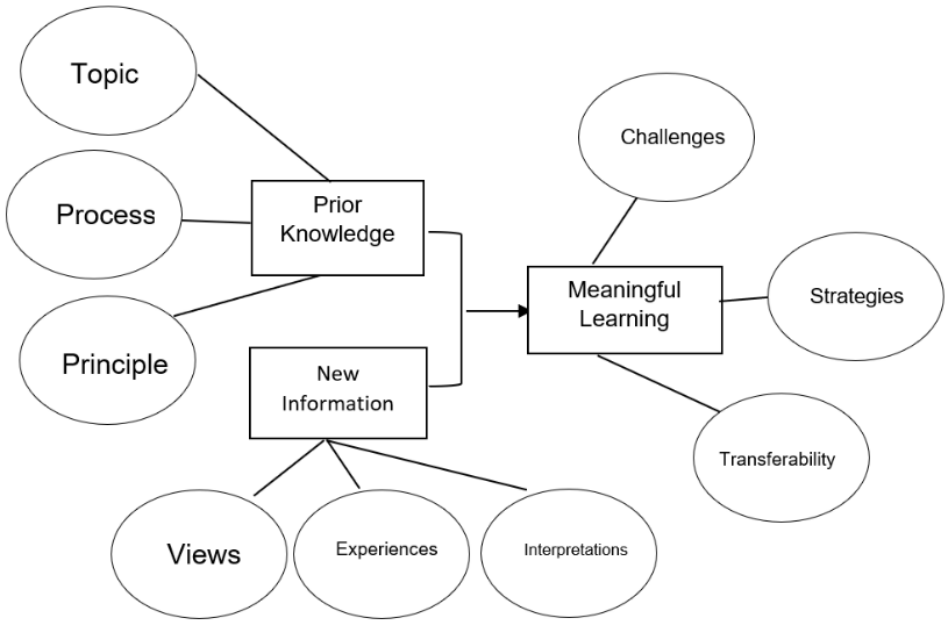

Figure 2. Modified Conceptual Paradigm of the Study based on Meaningful Learning Theory developed by Ausubel (1963)

Prior Knowledge in Mathematics: Topic, Process, and Principle Understanding

In listening to the participants, I learned that Grade 7 students' prior knowledge in mathematics can be grouped into three types**: topic, process, and principle.** In terms of **topic knowledge**, they understand fractions, fundamental operations, and introductory algebra concepts such as variables and integers. For **process knowledge**, they can apply step-by-step problem-solving and connect prior lessons, such as linking fractions to algebraic expressions. In terms of **principle knowledge**, they are aware of rules like the order of operations (GEMDAS) and recognize that even limited prior knowledge can guide them in learning new mathematical concepts.

Based on this realization, my finding supports Alreshidi (2023), who emphasized that strengthening topic-specific prior knowledge improves mathematics outcomes. Likewise, this also aligns with Niss (2021), who explained that mathematical understanding involves competencies and principles that connect concepts across topics.

In contrast, my finding contradicts Vosniadou (2022), who argued that students' prior knowledge in mathematics is often fragmented, inconsistent, and poorly structured, which can hinder their ability to connect it to new concepts. The present study, however, shows that in real instructional contexts, prior knowledge is not inherently limiting but can be activated and structured to support meaningful learning. While Vosniadou's work is theoretical and generalized, this study is qualitative descriptive and context-specific, providing empirical evidence from Grade 7 classroom experiences.

Perceptions of Learning Mathematical Concepts: Views, Experiences, and Interpretations

Through a careful review of my conversations with the participants, I came to understand that the three perceptions of Grade 7 students on learning new mathematical concepts—views, experiences, and interpretations—show a generally positive understanding of mathematics learning. Their views reflect that they perceive new lessons as simple, manageable, and less confusing, especially when tasks are clearly presented. Their experiences highlight the important

role of prior knowledge, as recalling and connecting previous lessons helps them improve comprehension, solve problems faster, and gain confidence in answering tasks. Meanwhile, their interpretations reveal that they associate mathematics learning with positive emotions such as happiness, excitement, and motivation, making the learning process more meaningful and engaging.

Based on this understanding, this finding corroborates with Boaler (2022), who noted that students develop more positive views of mathematics when learning experiences are supportive and meaningful. Similarly, prior knowledge helps improve understanding, confidence, and problem-solving efficiency (Alreshidi, 2023; Ningsih & Retnowati, 2020).

Conversely, my study challenges Dowker and Sheridan (2022), whose quantitative design reported mathematics as often associated with anxiety and negative emotions. Unlike their broad statistical findings, this qualitative descriptive study provides a deeper view of Grade 7 students' experiences, showing that mathematics is generally perceived as enjoyable, manageable, and positive when prior knowledge is used.

Perceptions of Connecting Prior Knowledge to New Mathematical Concepts: Challenges, Strategies, and Transferability

From the participants responses, I understand that Grade 7 students perceive three main aspects in connecting new mathematical information to their prior knowledge. First, they experience initial difficulty in linking new concepts with what they already know, particularly at the start of new lessons. Second, they report that learning becomes easier when they use strategies such as reviewing past lessons, reading textbooks, and receiving teacher guidance, which help them activate prior knowledge. Third, they perceive that prior knowledge and previously learned procedures are useful in understanding and solving new mathematical tasks.

My finding reinforces research suggesting that activating prior knowledge facilitates the integration of new mathematical concepts by reducing cognitive difficulty and supporting conceptual understanding (Alreshidi, 2023; Rach & Ufer, 2020). Likewise, this study supports the

claim of Boaler (2022) & Niss (2021) that Learners also benefit from reviewing previous lessons, receiving guidance, and using structured strategies to strengthen understanding.

On the other hand, my finding contradicts large-scale studies suggesting that transfer of prior learning does not always occur automatically and depends on context and instruction (Mullis et al., 2020; Rach & Ufer, 2020). While these studies use quantitative designs that highlight general patterns, they provide limited insight into classroom-level learning processes. Using a qualitative descriptive design with a small number of participants, this study shows that Grade 7 students can successfully activate prior knowledge when supported by appropriate instruction, indicating that learning transfer is strongly shaped by classroom context and teacher facilitation.

Future Direction of My Study

Building on the findings of this study, future research may use Multiple Linear Regression Analysis to examine whether the combination of prior knowledge and new learning can predict students' meaningful learning in mathematics, as this can help identify the factors that most strongly influence students' understanding and performance. Another possible direction is the use of Exploratory Factor Analysis (EFA) to develop and validate questionnaires that measure students' prior knowledge, acquisition of new knowledge, and meaningful learning, ensuring that the instruments used in research are accurate and reliable. These future studies may further improve how students' learning in mathematics is measured and understood and may also guide teachers in applying more effective strategies to support meaningful learning in the classroom.

Implications for Practice

Going through the entire process of my study, I came up with important implications for mathematics teaching at the secondary level, emphasizing the shared role of teachers and school leaders in promoting meaningful learning. Teachers may support students by activating prior knowledge through lesson reviews, questioning, short quizzes, and recalling real-life experiences related to the topic, while also strengthening students' recall skills. To build new understanding,

they may employ group discussions, guided practice, problem-solving activities, concept maps, hands-on tasks, and real-life applications that allow students to connect prior knowledge with new concepts and apply learning in meaningful ways. Teachers may also foster a supportive classroom environment where students feel safe to ask questions, make mistakes, and learn from challenges by using positive reinforcement and constructive feedback to guide improvement instead of focusing only on correct answers. In addition, school leaders may strengthen this process by providing continuous teacher training, adequate learning materials, and remedial or enrichment programs that address students' diverse learning needs.

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