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The Use of APE “Numtrack” to Teach Students in Numeracy: A Case Study at ICC Al Anshar Bahau, Malaysia

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Abstract: This study examines the use of APE Numtrack to improve students' numeracy skills, particularly in environments with limited technological access and a shortage of qualified teachers. The study is motivated by the observation that many students struggle with basic numeracy due to inadequate instructional resources and learning tools. Conducted at ICC Al-Anshar, Bahau, Malaysia, this study employs a qualitative method with a case study approach. The informants include teachers and students who directly engage with APE Numtrack in their learning process. Data were collected through classroom observations and semi-structured interviews and analyzed thematically to identify recurring patterns and insights. The findings indicate that APE Numtrack significantly enhances students' understanding of basic numeracy by providing interactive and personalized feedback, making learning more engaging. However, some challenges were identified, particularly regarding the durability and functionality of the tool. The study implies that while APE Numtrack is an effective learning aid for foundational numeracy skills, its application remains limited for more complex mathematical concepts. Based on these findings, future research is recommended to explore ways to improve APE Numtrack's durability and expand its functions to accommodate advanced mathematical content, ensuring its broader usability in various educational settings.

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INTRODUCTION

Numeracy skills are a fundamental component of education, particularly in primary education. Numeracy is defined as the ability to understand and use numbers in daily life, encompassing skills beyond basic arithmetic (Dieckmann, 2008). By understanding numeracy concepts, students can grasp more complex mathematical components that will be learned in higher education levels. Moreover, strong numeracy skills enhance students' cognitive abilities and make it easier for them to solve problems involving calculations (Nahdi et al., 2021). This means good numeracy skills can be applied in daily life situations, such as buying and selling, managing finances, analyzing information, presenting data, making decisions, and other social interactions. Therefore, teaching numeracy concepts to children is crucial, as they will face both academic and non-academic challenges in the future. Numeracy is the ability to include understanding and processing numbers that are very important for solving problems and making decisions. According to Viona Adelia et al (2023), Numeracy is a basic skill that underlies various aspects of daily life, education, and work. Which leads to the development of various teaching methods and tools aimed at improving students' numeracy skills because of that the importance of numeracy in education has been widely recognized. One such tool is the use of educational-based games, which have become popular in recent years. The use of games also includes the concept of "Active Learning" because it is relevant in the context of teaching numeracy. According to Isabel Vale & Ana Barbosa (2023), active learning strategies are learning processes through activities and discussions that involve students in the learning process because they can improve their understanding and memory of mathematical concepts. The use of APE is in line with this approach, as it allows students to engage with numerical concepts through hands-on activities and real-time feedback.

According to Anita Solihatul Wahidah & Indri Sulistyani (2022), APE, or "alat permainan edukatif" is an educational play tool created to make education more interesting for children and facilitate their learning through play. APE plays an important role in cognitive development that helps children think critically, creativity through direct experience, and problem-solving skills. According to Baik Nilawati Astini et al (2020), There are 2 types of APE types, including Traditional: made from simple tools such as cardboard or so on Modern APE: Involves technology-based games such as applications for interactive learning. APE has the benefit of increasing learning to be more fun and motivating. And its adaptability can be adjusted to meet various needs and learning styles. a fun and effective learning experience that encourages skill development, therefore APE is very important in children's education (Maya Regita Gunawan et al 2023).

Meanwhile, teachers have a role in facilitating numeracy learning. It is very important for the successful implementation of innovative teaching methods with effective teacher training and professional development. According to Pandi Rais & Nurdyansyah (2023), emphasize the need for teachers to be equipped with the skills and

knowledge needed to effectively integrate technology into their teaching practices. Because this highlights the importance of ongoing training for educators in using APE such as Numtrack to improve numeracy teaching.

Numtrack, an *Alat Permainan Edukatif* (APE) specifically designed to improve students' numeracy skills. Numtrack is made from small rectangular cardboard measuring 20×15 cm, coated with plaster for durability. The numbers written on the surface are erasable after each session. The cardboard features dashed lines forming numbers and holes that match the written number. For instance, a cardboard with the number "6" has six holes. Students must insert color-coded cotton buds approximately 5 cm long into the holes and complete writing the number perfectly.

Despite the critical importance of numeracy skills, many students still struggle to master them. Several factors contribute to low numeracy skills among students, including internal and external influences. Internal factors encompass attitudes towards learning, motivation, and health (Meliana et al., 2023). These factors lead to low self-confidence and motivation among students to further engage with mathematics. Some even become reluctant to learn mathematics because they lose interest early in the learning process. Factors influencing creative teaching include demographic, individual, and organizational elements, with self-efficacy and environmental support being most prominent (Pazin Fadzil et al., 2022).

Preliminary observations at ICC Al Anshar Bahau, a tutoring center in Malaysia, indicate that students' numeracy skills and abilities are still relatively low. All students in this school are children of Indonesian migrants working in Malaysia, who have limited access to quality education and formal school systems. These limitations include a lack of classroom facilities, unstandardized curricula, and a shortage of teaching staff at ICC Al-Anshar Bahau. This situation is worsened by students' habits of overusing gadgets, which reduces their interest in learning, particularly numeracy. Consequently, they struggle to focus during lessons and have difficulty understanding the materials presented. For instance, students have trouble understanding simple problems like addition and subtraction due to a lack of varied teaching approaches. Teacher handle many students with limited resources, making it difficult to give each student adequate attention. Visual tools, defined as physical objects representing abstract mathematical skills, can be effectively used in numeracy classrooms to support learning (Smith & Cekiso, 2020). Teacher can use ETA to simplify the understanding of basic numeracy concepts.

Several previous studies have shown that the use of APE when learning mathematics improves students' mathematical understanding. A study by (Anawati et al., 2023) found that the use of APE in spatial construction learning improved teachers' skills in making and using APE, which in turn exposed students to mathematical concepts affecting understanding. In addition, study by (Syamsiyah et al., 2023) at SDN 072/VII Pangindaran developed an APE "Ular Tangga Berhitung" Numeracy to improve students' math skills. This research highlights the importance of creating a fun learning atmosphere through the use of APE that can motivate students to learn math more

actively. In addition, another study conducted at Taman Kanak-Kanak Negeri Pembina Bansiri by (Trianingsih, 2023) found that APE such as sand and smart boards were effective in improving early childhood arithmetic skills in recognizing number symbols from 1 to 5. As a result, the use of these APE improved children's understanding of number symbols as reflected in the increase in the proportion of students who reached the highly developed category (BSB). These studies show that the use of various educational tools, including educational games and technological media, has a positive effect on children's understanding of number symbols.. However, most APE used in these studies remain general and are not specifically designed to address the unique needs of teaching basic numeracy. As a solution to these challenges, this study introduces Numtrack, an *Alat Permainan Edukatif* (APE) specifically designed to improve students' numeracy skills.

Although previous studies have examined the use of APE to improve numeracy skills, most of the APE used are designed for students who have access to formal education and adequate technology, and no one has introduced EAPs specifically for immigrant children who lack access to formal education.

This study aims to fill this gap by introducing 'Numtrack,' which is an APE specifically designed to improve numeracy skills in immigrant students in Malaysia. Introducing an innovative learning medium, 'Numtrack' offers a user-friendly approach amidst the limited access experienced by this group.

METHOD

This study used a qualitative case study approach to explore the effectiveness of using the APE “Numtrack” in teaching counting to students at ICC Al Anshar Bahau. A qualitative case study design was chosen to gain an in-depth understanding of the teaching and learning process using Numtrack. The focus was to describe the experiences and interactions of students and educators during its implementation. This research was conducted at ICC Al Anshar Bahau. The participants consisted of 7 students who were taught counting using the “Numtrack” APE. The teacher responsible for implementing the APE also played an important role in providing contextual information.

Data collection in this study was interviews and observations with students and 2 teachers which were presented as complete and detailed data to analyze interactions, teaching methods, and student engagement. Data analysis from interviews and observations were analyzed using several stages: Data reduction, data presentation, and conclusion drawing and verification.

Research Flow

1. Determination of Location and Participants the study was conducted at ICC Al Anshar Bahau.
2. Participants consisted of 7 students who were taught numeracy using Numtrack.

3. Teachers played a role in implementing Numtrack and providing contextual information about the learning process.

Data Collection

1. Observation: Directly observing how Numtrack is used in learning, student interactions, teacher teaching methods, and the level of student engagement.
2. Interview: Conducting semi-structured interviews with students and teachers to obtain their perspectives on the use of Numtrack, the challenges faced, and its effectiveness in learning numeracy.

Data Analysis

1. Data Reduction: Filtering and organising the collected data to focus on relevant findings.
2. Data Presentation: Displaying data systematically to identify emerging patterns and themes.
3. Conclusion Drawing and Verification: Interpreting the research results and verifying them through data triangulation to ensure the validity of the findings.

RESULTS AND DISCUSSION

Observation

During Numeracy learning using APE Numtrack, it was seen that students were very eager to participate in learning, they found it easier to work on problems with Numtrack compared to learning with conventional methods. For example, when the teacher there gave a challenge to complete the addition of the number 10, all students quickly finished with the correct answer. Some of them can also help their other friends if they are slow to complete the task. For example, some students who used to play with their gadgets in the middle of the lesson were seen forgetting their gadgets until the learning session was over. They even confidently showed their work on Numtrack in front of the class. In addition, there is an exciting interaction between them during learning, they often collaborate with their other friends.

However, the teacher had to switch to conventional methods when she wanted to teach the learning materials of multiplication and division, the teacher felt that Numtrack did not support such learning.

Interview

To support the observation, interviews were also conducted with students and teachers of ICC Al-Anshar Bahau:

Azkiya: "Saye lebih paham belajar pakai ni kak, mule-mule saye tengok angka kad sini, habis tu saye hitung stik yang kene tusuk kan."

Meaning: "I understand better learning to use this APE, first, I look at the number here, and then I count the cotton buds that need to be pierced here."

The teachers commented:

Azizah: *"Kalau belajar macem ni, senang lah tinggal saye kasi perintah, lalu tengok mereka berhitung, mereka pun paham dan seronok."*

Meaning: "If learn like this, it is easy to stay with the order, then watch them pay. They also understand and have fun"

Eny Listyowati: *"Terimakasih mbak Anisa dan Mbak Bela, sudah memberikan media pembelajaran Numtrack ini, Anak-anak jadi lebih bersemangat dan senang sekali saat belajar, ternyata mbak-mbak ini kreatifya."*

Meaning: "Thank you, Ms. Anisa and Ms. Bella, for providing the Numtrack Learning media, The children are more enthusiastic and happy when learning, it turns out that these ladies are crative."

Limitations also arose when the teacher wanted to explain different materials such as multiplication and division, as they had to switch to conventional methods because the APE Numtrack could only be used for addition lessons. The teacher remarked:

Azizah: *"Bagus saye sangat terbantu, tapi saye tak boleh ajar mereke perkalian dan pembagian dengan Numtrack, bolehlah nanti buat yang perkalian dan pembagian kak."*

Meaning: "This is good, it helps me a lot, but I can't teach them multiplication and division with Numtrack. Maybe you can create one for multiplication and division later?"

Aisyah: *"Saye nak main lagi, tapi kenapa permainannya dah nak rusak macem tu."*

Meaning: "I want to play again, but why is the game already getting damaged like that?"

Discussion

This study demonstrates that the APE Numtrack significantly contributes to the numeracy learning process, particularly in enhancing conceptual understanding, the findings reveal that Numtrack serves as an effective visual aid for introducing numbers and quantities to students. This tool enables students to understand the relationship between numbers and quantities through hands-on experience, such as inserting sticks corresponding to the numbers on the tool. Piaget's cognitive constructivism emphasizes the importance of direct, interactive experiences in children's learning and development (Robson, 2019). Students like Azkiya, who reported easier learning through Numtrack, illustrate how this tool supports foundational numeracy concepts.

Numtrack simplifies the teaching process, especially for basic numeracy lessons. Teachers only need to give simple instructions without extensive explanations or traditional methods like writing on the blackboard. This approach is more efficient and saves time, as noted by teachers who stated that Numtrack helps students grasp the material more quickly. Teachers generally have positive perceptions of visual aids, viewing them as crucial for effective teaching (Lhendup, 2023).

Numtrack serves as an effective visual aid for Numeracy, despite its many advantages, Numtrack has some limitations that require attention: **Durability:** Numtrack uses cardboard as its main material, which is prone to damage when exposed to water, sunlight, or frequent use. Extra care is needed to ensure the tool's longevity. **Functionality:** Numtrack is best suited for basic numeracy lessons, such as addition. It is less relevant for more complex mathematical concepts, necessitating further development to make it applicable in higher educational levels. This study suggests that Numtrack can be a viable solution for numeracy learning in schools with limited resources. However, further development is necessary to enhance material durability and expand the tool's functionality. Future research could explore Numtrack's application for more complex mathematics or as a tool to develop students' critical thinking and problem-solving skills.

This study involved only seven students from ICC AL-Anshar Bahau, limiting the generalizability of the findings. Future studies could include a larger sample from various schools and examine Numtrack's effectiveness in other learning contexts, such as more complex mathematical operations or relevant subjects. This study suggests that Numtrack can be a viable solution for numeracy learning in schools with limited resources. The findings indicate that Numtrack enhances students' understanding of basic numeracy by providing interactive and engaging learning experiences. **Implications** of this research highlight that Numtrack can serve as an effective tool for foundational numeracy education, particularly in under-resourced schools. However, its current limitations in material durability and functionality suggest that further improvements are needed to maximize its long-term effectiveness. Future research could explore Numtrack's application for more complex mathematical concepts or its potential to develop students' critical thinking and problem-solving skills. Additionally, this study involved only seven students from ICC AL-Anshar Bahau, which limits the generalizability of the findings. Future studies should include a larger sample from various schools and investigate Numtrack's effectiveness in different learning contexts, such as advanced mathematical operations or integration into other subjects.

CONCLUSION

APE Numtrack significantly effective in enhances student understanding in Numeracy. However, challenges related to durability and functionality were identified. The study concludes that APE Numtrack is a promising tool for improving numeracy skills, with the caveat that it is best suited for basic-level materials and not for more complex topics. Future research is recommended to develop APE Numtrack with broader functions, particularly for more advanced mathematical content.

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