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Exploration of Mathematical Concepts in Truk Drivers' Activities as a Context for Mathematics Learning in Grade II Elementary School

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ABSTRACT

This study aims to explore mathematical concepts in truck driver activities and their relationship to the topic of time duration in Grade II elementary school mathematics. The study employed a qualitative method with an autoethnographic approach. Data were collected through narrative writing, interviews, and documentation based on the researcher's direct experience and analyzed using Spradley's model, including domain, taxonomic, and componential analysis. The findings reveal that truck driver activities involve several mathematical concepts, including time measurement, time comparison, and simple arithmetic operations. Among these, measuring time duration emerged as the most dominant concept, as truck drivers' activities are closely associated with departure schedules and travel time. The findings indicate that the mathematical concepts identified in truck driver activities are aligned with the Grade II elementary school learning outcomes related to comparing time durations. Furthermore, these findings provide authentic real-life contexts that can be integrated into mathematics instruction, helping teachers design more meaningful learning experiences and supporting students in understanding the concept of time duration through familiar everyday activities.

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Education plays a crucial role in developing students' thinking skills, starting in elementary school. At this stage, students are in the initial phase of building conceptual understanding that will serve as the foundation for subsequent learning (Wardani et al., 2024). One subject that plays a strategic role in developing logical and systematic thinking skills is mathematics (Wahyu et al., 2021). Mathematical concepts are sequentially structured and interrelated, ranging from simple to complex, making conceptual understanding a crucial aspect in achieving learning objectives (Khasanah et al., 2020). A good understanding of mathematical concepts is a key factor influencing student success in learning (Rismen, 2021). This is in line with (Siregar, 2021) who stated that conceptual understanding is the foundation for developing students' mathematical thinking skills.

However, in practice, mathematics in elementary schools is often viewed as a difficult subject because its presentation tends to be abstract and is not closely related to students' daily lives (Sa'adah & Ariati, 2020). This condition makes it difficult for students to connect mathematical concepts to their real-life experiences. One topic that is still considered difficult by elementary school students is measuring time, particularly in understanding the duration of an activity. Students often have difficulty reading clocks, determining the length of time, and comparing the duration of different activities (Atmasita et al., 2024). In fact, these skills are part of the learning outcomes of mathematics in grade II of elementary school, namely students being able to compare the duration of an activity. This condition indicates that learning still does not fully support concrete conceptual understanding in accordance with the characteristics of students' cognitive development at the concrete operational stage (Amalia & Mariana, 2023).

This condition is also reinforced by Piaget's theory of cognitive development, which states that elementary school students in the concrete operational stage understand mathematical concepts more easily through concrete experiences and real-life situations rather than abstract explanations (Tampubolon et al., 2025). In this regard, truck drivers' daily activities, such as preparing for departure, estimating travel time, and waiting during work, provide authentic and observable contexts that can help students relate the abstract concept of time duration to meaningful real-world experiences. Therefore, mathematics learning needs to be linked to everyday life contexts to make it more meaningful (Naja et al., 2022). Learning that connects mathematical concepts with real experiences has been shown to improve students' conceptual understanding (Yolanda et al., 2024). One approach that can be used is ethnomathematics, which connects mathematical concepts with cultural activities and community life (Octaviani & Mariana, 2023). Through this approach, mathematics learning can be presented contextually so that it is more relevant to students' social environment (Hignasari, 2020). This perspective is also consistent with (d'Ambrosio, 1985) who views mathematics as an integral part of human cultural activities.

One activity closely associated with rural communities is the work of truck drivers transporting crops, sand, fill, and building materials. This activity involves a series of steps, including departure time, travel time, waiting time for the load, and the unloading process. Each stage takes place within a specific

timeframe, related to the concept of time duration. The concept of time duration is part of the time measurement material in second grade elementary school, which includes understanding hours and minutes and determining the duration of an activity (Falentina et al., 2024). In the context of everyday life, the concept of time is understood not only symbolically but also through direct experience (Angel et al., 2025). Thus, the activities of truck drivers have the potential to incorporate relevant mathematical concepts to be explored from an ethnomathematics perspective.

Based on interviews with second-grade teachers at Karas 2 Elementary School, the topic of time duration remains one of the most difficult topics for students to understand, especially in reading time, converting hours and minutes, and determining the time difference between activities. Learning tends to be procedural, causing the concept of time to be understood separately from students' daily experiences (Sari, et.al, 2025). This indicates the need to explore real-life contexts that include the concept of time duration to support more concrete and meaningful learning. This condition encourages the need for studies that link mathematical concepts to real-life activities that are close to students' lives.

Previous studies have consistently demonstrated that an ethnomathematics approach can utilize cultural activities and everyday environments as meaningful contexts for mathematics learning in elementary schools. Various mathematical concepts have been identified in different real-life contexts, such as the Suroboyo Bus service (Ekasri & Mariana, 2020) and the architecture of the Al-Akbar Mosque in Surabaya (Ana & Mariana, 2022) demonstrating the potential of contextual learning to support students' understanding of mathematics. However, these studies primarily focus on public facilities and cultural or architectural objects, emphasizing mathematical concepts such as numbers, geometry, measurement, and data processing. Consequently, occupational activities have received limited attention as sources of ethnomathematical learning, particularly in relation to the concept of time duration in lower elementary school mathematics.

Therefore, this study seeks to address this gap by investigating the mathematical concepts embedded in truck drivers' daily activities. Specifically, this study addresses the following research question: How do mathematical concepts emerge in truck drivers' activities? To answer this question, the study aims to identify and analyze the mathematical concepts embedded in truck drivers' activities and xamine their relevance to Grade II elementary school mathematics learning, with particular attention to the concept of time duration.

METHODS

This research employed a qualitative method with an autoethnographic approach. This approach was selected because the researcher had direct experience and involvement in truck drivers' daily activities, enabling an in-depth exploration of the mathematical concepts embedded within these

activities. A qualitative approach is used to deeply understand and interpret social phenomena based on the realities of what occurs in the field (Waruwu, 2024). The autoethnographic approach places the researcher's personal experiences as the primary source in uncovering cultural meanings and social practices (Poulos, 2021). The researcher had prolonged engagement with truck drivers' activities through direct experiences accompanying her father, who works as a truck driver. These experiences were complemented by interviews and documentation to provide a richer understanding of the activities being studied. The research was conducted in Jubleg Hamlet, Gerih Village, Gerih District, Ngawi Regency, which is the researcher's residential area and the location of the truck drivers' activities, which are the focus of the research. The research period was from June 2025 to April 2026, encompassing the exploration, data collection, and data analysis stages.

The research procedure began with an exploration of truck drivers' time management activities, including departure times and travel durations. Prior to data collection, the participant was informed about the purpose of the study and voluntarily agreed to participate in the interviews and documentation process. Consent was obtained for the use of the interview data and activity documentation for research purposes. The interview involved one participant, namely the researcher's father, who works as a truck driver and served as the key informant in this study. The exploration was conducted through several stages narrative writing, interviews, and documentation. In the narrative writing stage, the researcher wrote down experiences and observations in a coherent and reflective manner. A semi-structured interviews were conducted to strengthen the findings regarding how truck drivers understand and manage time duration in their daily activities. Documentation was conducted to strengthen the data obtained through narrative writing and interviews, in the form of photographs of activities and real-life situations that support the relationship between truck drivers' activities and the concept of time measurement.

The research data sources consisted of primary and secondary data. Primary data were obtained from the researcher's experiences and reflections through narrative writing, interviews with informants, and documentation of truck drivers' activities. Secondary data were obtained from various relevant literature, such as scientific articles, journals, and previous research related to ethnomathematics, contextual learning, and the concept of time measurement in elementary schools. These secondary data were used to strengthen the theoretical foundation and support the interpretation of the research findings.

The data analysis followed (Spradley, 2016) analysis model, which includes domain analysis, taxonomic analysis, and componential analysis. Data obtained from narrative writings,

interviews transcripts, and documentation were reviewed and organized prior to analysis. Domain analysis was conducted to identify general categories of truck driver activities that contain mathematical concepts. Taxonomic analysis was used to group and describe the mathematical concepts found in each activity. Furthermore, componential analysis was conducted to identify specific characteristics of these mathematical concepts, particularly those related to time measurement and duration of time as part of the learning materials for grade II elementary school. Data credibility was enhanced through triangulation of techniques by comparing data obtained from narrative writing, interviews, and documentation. The use of multiple data collection techniques enabled the verification and strengthening of the research findings. Transferability testing was conducted by presenting a detailed and systematic description of the research. Dependability testing was conducted through consistent documentation of the research process, while confirmability testing was conducted by re-checking the data and findings with the participant.

RESULTS AND DISCUSSION

Result

The data in this study were obtained through an autoethnographic approach using narrative writing techniques, namely writing about the researcher's personal experiences reflectively related to the activities of truck drivers in the daily lives. The researcher explored experiences through direct involvement in truck driving activities, which was obtained from the habit of following the researcher's father when he worked as a truck driver. This involvement provided a deep understanding of the various activities carried out. Data collection was carried out through narrative writing, interviews, and documentation. Narrative writing was used to reflect on the researcher's experiences, interviews were conducted with the researcher's father to confirm and strengthen the data, while documentation was used as supporting data.

In this study, the discussion focuses on two main activities: departure preparation and the journey to the mine. To provide a more concrete overview, the following is a narrative writing section related to departure preparation activities:

> *"Since I was little, my father has worked as a driver. I often saw him getting ready for work while the sky was still dark. His departure time varied every day, sometimes when the sun was already high, sometimes before I woke up, he was already on his way. The cool morning air didn't stop him from heading to the garage next to the house, where his truck was parked. After starting the engine, while waiting for it to*

warm up, my father walked around the truck to make sure all the tires were in good condition. Not only that, but he also made sure the turn signals and brakes were working properly. Those 10 minutes in the morning determined the smoothness of my father's work day, and he never missed that moment."

To strengthen these findings, interviews were conducted with informants. The results of the interviews indicated that variations in departure times were influenced by the type of load and queue conditions at the mine. In addition, the informants also emphasized that vehicle inspections were always carried out before departure as a routine step. These inspections included checking the turn signals to ensure they were functioning properly (as shown in **Figure 1**), checking the condition of the tires to check pressure and suitability for use (as shown in **Figure 2**), and checking the brakes to ensure safety during the trip (as shown in **Figure 3**).

Figure 1. Turn signal check

Figure 2. Tire condition check

Figure 3. Brake check

Based on the narrative writing and interview results that have been presented, mathematical concepts that emerged in departure preparation activities can be identified as presented in **Table 1**.

Table 1. Mathematical concepts in departure preparation activities

No	Aspects in the Story	Contextual Findings	Mathematical Concepts	Explanation
1.	Departure time (4.00 a.m., 6.00 a.m., 7.00 a.m.)	Departure time is not always the same	Meansuring time, reading clocks, comparing times	Understanding time units, comparing earlier-later times, and ordering time
2.	Inspection time (5-10 minutes)	Vehicle inspection time	duration, time estimate, range	Calculating activity time, understanding time intervals, and making estimates
3.	Difference in departure times	Difference between 4.00 a.m. and 7.00 a.m.	Time comparison	Comparring two times, the concept of earlier and later
4.	Tire inspection	Ensuring tires are in good condition	Length and size meansurements	Related to wheel diameter and tire pressure (concept of quantities and units)
5.	Turn signals	Ensuring lights are functioning	Direction and position (spatial orientation)	Understanding the concept of right and left as relative positions in space
6.	Engine warm-up time	Wait approximately 5 - 10 minutes	Estimate	Sensitivity to process length and the use of estimates in measurements
7.	Departures between 4.00 a.m. and 7.00 a.m.	Time is within a certain range	Data intervals and variations	Understanding that a quality can be within a lower and upper limit
8.	Difference in departure time and inspection duration	The difference between departure time (4.00 a.m., 6.00 a.m., 7.00 a.m.) and inspection duration is 5-10 minutes	Arithmetic operations (addition and subtraction of time)	Calculate the time difference and add the duration to the initial time

The findings indicate that mathematical concepts are embedded in truck drivers' daily work practices. As shown in **Table 1**, departure preparation activities involve concepts such as time measurement, comparison, arithmetic operations, quantity measurement, and data representation. From an ethnomathematical perspective, these concepts emerge naturally from practical work activities and have the potential to serve as contextual resources for mathematics learning. After examining departure preparation activities, the next stage in a truck driver's work is the journey to the mine, which also reflects various mathematical concepts in practice. To illustrate this, the following is a presentation of the researcher's experience in narrative writing:

"After ensuring the truck was ready to go, Dad slowly pulled the vehicle out of the garage and started driving towards the mine around 7:00 AM. I sat next to him,

watching the long road stretch out ahead. The trip from our house to the mine usually took about an hour. That day, the roads were quiet, so the trip didn't feel long, and I checked the time on my phone several times. Sure enough, we had been on the road for almost 50 minutes. Sitting in the truck made me realize that 50 minutes wasn't that long."

To strengthen the findings, researchers also conducted interviews with informants regarding travel time to the mine. The interviews revealed that travel time is not always constant but is influenced by several factors, such as distance traveled, material collection location, and road conditions, as shown in **Figure 4**. Overall, travel time is less than 90 minutes.

Figure 4. Journey to the mine

Based on the narrative writing and interview results that have been presented, it can be identified that there are mathematical concepts that emerge in the journey to the mine, as presented in **Table 2.**

Table 2. Mathematical concepts in the activity of traveling to the mine

No	Aspects in the Story	Contextual Findings	Mathematical Concepts	Explanation
1.	Departure time and trip duration	Departure at 6:15 a.m. or 7:00 a.m.; travel duration of 50 minutes, approximately 1 hour, and less than 90 minutes	Time measurement	Reading a clock, understanding minute-hour units, calculating duration and time difference
2.	The journey is faster because the road is quieter	A 50 minutes is faster than 60 minutes	Time comparison	Calculate the difference (60-50 = 10 minutes), compare faster longer
3.	Difference in travel duration	Travel time depends on distance and road conditions	Relationship between distance and time (speed)	Is the distance remains constant and the time is shorter, then the speed is hinger
4.	Variation in travel duration	Travel time ranges from 50 to nearly 90 minutes	Data variation and range	Time range approximatelt 40 minutes (90-50) minutes

No	Aspects in the Story	Contextual Findings	Mathematical Concepts	Explanation
5.	Travel time limits	Travel duration ranges from 50 to 90 minutes	Time interval	Shows the lower and upper limits of the travel duration
6.	Comparison of travel durations	Travel times og 50,60, and less than 90 minutes are compared	Arithmetic operations involving time	Calculating the difference in travel time, for example 60 – 50 = 10 minutes

From an ethnomathematical perspective, the mathematical concepts presented in **Table 2** emerge from truck drivers' daily experiences during travel. Drivers continuously interpret departure times, estimate travel durations, and compare travel conditions to make decisions while carrying out their work. These These practices demonstrate that mathematical reasoning is embedded in real-life occupational activities.

After looking at the analysis of truck driver activities, it shows that several mathematical concepts emerge, there are similarities and differences in the concepts as follows:

Table 3. Mathematical concept equation

No	Mathematical Consepts	Preparation for Departure	Journet to the Mine
1.	Time measurement	✓	✓
2.	Time comparison	✓	✓
3.	Time calculation operations	✓	✓
4.	Time intervals	✓	✓

Table 3. shows that several mathematical concepts emerge during both departure preparation and the journey to the mine, namely time measurement, time comparison, time arithmetic operations, and time intervals. This indicates that these concepts are general and consistently used across truck drivers' activities.

Table 4. Differences in mathematical concepts

No	Mathematical Consepts	Preparation for Departure	Journet to the Mine
1.	Distance time relationship		✓
2.	Time interval		✓
3.	Time duration	✓	
4.	Length and magnitude measurements	✓	
5.	Direction and position	✓	
6.	Estimation	✓	

Based on **Table 4**, it can be seen that some mathematical concepts only appear in certain activities. Concepts such as distance-time relationships and modes appear in the activity of traveling to the mine because this activity involves movement, distance traveled, and variations in travel time. Meanwhile, concepts such as measuring length and magnitude, direction and position, and, estimation are more often found in departure preparation activities because they are related to checking vehicle condition, determining position, and planning before the trip. This difference indicates that the emergence of mathematical concepts is influenced by the characteristics of each activity.

After conducting a taxonomic analysis to group concepts based on their similarities and differences, the next stage is componential analysis. This analysis aims to explore the meaning and educational potential of the concepts discovered, particularly in relation to mathematics learning in elementary schools. Through this stage, concepts such as measuring time, distance, and comparison are analyzed in more depth as contextual and meaningful learning contexts for students.

Table 5. Elementary school learning outcomes

Mathematical Concepts	Phase	Learning Outcomes
Time Comparison	A	Students can compare time durations
Arithmetic Operations	B	Students can perform addition and subtraction operations on whole numbers up to 1,000. They can perform multiplication and division operations on whole numbers up to 100
Time measurement	C	Students can calculate the duration of time

Based on the componential analysis results in **Table 5**, this study focused on Phase A, which focuses on the concept of comparing time, as it aligns with the developmental level of elementary school students. At this stage, students more easily grasp concrete concepts relevant to everyday life, such as comparing time durations. Furthermore, the ability to compare time forms the foundation before students learn more formal duration calculations. Therefore, Phase A is considered appropriate as the initial foundation for learning the concept of time.

Discussion

The results of the study indicate that truck drivers' activities incorporate various mathematical concepts, particularly those related to time measurement, such as duration, comparison, arithmetic operations, and time intervals. These concepts emerge during departure preparation and the journey to the mine, demonstrating that mathematical thinking is embedded in everyday work practices. From an ethnomathematical perspective, the findings suggest that

mathematical knowledge is not only acquired through formal education but is also developed and applied through practical experiences in daily life. This supports the view of (Rahmawati et al., 2025) who stated that cultural activities or daily life can incorporate relevant mathematical concepts and can be used as a learning context in elementary schools. Therefore, truck drivers' activities have the potential to serve as contextual learning resources that connect school mathematics with students' real-life experiences.

The findings also reveal that mathematical concepts are present not only in core activities such as traveling but also in supporting activities, including checking turn signals, tire conditions, and brakes. These activities involve concepts of direction, measurement, and estimation that are applied naturally in the workplace. This finding expands the understanding of ethnomathematics by showing that mathematical ideas can emerge from routine occupational practices, not only from traditional cultural activities. In line with (Darmawan & Gunamantha, 2021), mathematical concepts can be embedded in daily habits and activities without being consciously recognized by the individuals involved. This indicates that mathematics functions as a practical tool for solving real-life problems and supporting work-related decision-making.

This study contributes to the ethnomathematics literature by presenting truck drivers' activities as a context that has received limited attention in previous studies, particularly in relation to time duration learning in Grade II elementary school. Unlike previous studies that generally identify mathematical concepts in cultural practices, this study highlights how concepts of duration, time differences, and time comparison emerge from occupational activities. Consistent with (Efendy et al., 2025) the findings suggest that the exploration of mathematical concepts from the surrounding environment can provide a foundation for developing more contextual and innovative learning resources. Thus, this study broadens the scope of ethnomathematics by demonstrating that everyday work activities can also serve as meaningful sources of mathematical learning.

The potential of truck drivers' activities as a learning context lies in their closeness to students' daily lives and their ability to illustrate abstract concepts through concrete situations. Rather than merely presenting mathematical procedures, this context allows students to relate mathematical ideas to real experiences involving schedules, travel duration, and time estimation. This finding supports (Tarigan & Sukmawarti, 2025), who reported that ethnomathematics-based learning can enhance students' understanding of mathematical concepts. Similarly, (Ekasri & Mariana, 2020), emphasized that everyday activities, including transportation-related activities, contain mathematical concepts that can be utilized in learning. Therefore, truck drivers' activities

provide a relevant and meaningful context for supporting mathematics learning, particularly in understanding the concept of time duration.

CONCLUSION

This study found that truck drivers' daily activities contain mathematical concepts, particularly those related to time duration, that are relevant to Grade II elementary school mathematics learning. These findings extend the existing ethnomathematics literature by demonstrating that occupational activities, particularly truck drivers' daily work, can serve as meaningful contexts for identifying mathematical concepts and connecting them to elementary school mathematics learning. Practically, this study provides an alternative real-life context that teachers can use to support more meaningful learning of time duration in elementary schools. Future research is encouraged to explore mathematical concepts embedded in other occupational contexts and investigate their application to different mathematics topics and grade levels.

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