

Road Safety Education as a Predictor of Knowledge of Road Signs Among Road Users in Toril District, Davao City

Hyacint Erich P. Lazo¹ , Crizle Kate F. Husain² , Flora May S. Castro³ , Patrick R. Vequilla⁴ 

Author Information:

¹⁻⁴Davao Central College, Inc. Juan dela Cruz
Street Toril, Davao City, Philippines

Correspondence:

hyacintlazo@gmail.com

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Abstract. Limited knowledge of road signs among road users remains a road safety concern. This study aimed to determine the relationship between road safety education and knowledge on road signs among road users in Toril District, Davao City. The study employed a quantitative descriptive-correlational and predictive research design involving 150 licensed drivers selected through purposive sampling. Data were collected using a validated researcher-made questionnaire and analyzed through mean, standard deviation, Pearson Product-Moment Correlation, and linear regression. The findings revealed that respondents demonstrated a very high level of road safety education, while their knowledge of road signs was rated high. Among the dimensions of road safety education, the practical driving test obtained the highest mean, whereas the automated driving course received the lowest. In terms of knowledge of road signs, respondents obtained the highest mean in regulatory signs and the lowest in warning signs. Statistical analysis further revealed a significant but weak positive relationship between road safety education and knowledge of road signs, indicating that higher levels of road safety education were associated with better knowledge of road signs. The predictive analysis likewise showed that road safety education significantly predicted knowledge of road signs, although its contribution was limited. The findings suggest that road safety education is associated with and contributes to drivers' knowledge of road signs, but other factors may also influence their level of understanding. These findings highlight the need to strengthen road safety education, particularly in warning sign recognition and hazard awareness. Future studies may investigate additional factors influencing drivers' understanding of road signs, including behavioral, environmental, demographic, and local road culture factors, to further enhance road safety programs and driver education initiatives.

Keywords: Licensed Drivers; Road Safety Education; Road Signs; Traffic Sign Knowledge

Introduction

Road signs are visual symbols or markings positioned along roads to guide, warn, and inform all licensed drivers regarding rules and conditions of the road. They are essential for maintaining traffic safety and orderly flow, helping drivers make correct and timely decisions while operating a vehicle. These signs include regulatory signs, which indicate rules and restrictions; warning signs, which alert drivers to potential hazards; and informational signs, which provide directions or useful guidance. For these signs to be effective, licensed drivers must have adequate road safety education and training to understand their meanings. Inadequate knowledge of traffic signs can impair drivers' decision-making, leading to unsafe driving behaviour and increased risk of accidents.

Globally, poor comprehension of traffic signs and insufficient road safety education remain significant contributors to road accidents. According to the World Health Organization (2023), approximately 1.19 million people die annually from road traffic crashes, many of which involve driver errors attributable to gaps in knowledge and behaviour. Although global initiatives like the Decade of Action for Road Safety (2021–2030) aim to improve road safety, evidence suggests that lack of driver education and training about sign meanings still affects many countries. For example, Maulina et al. (2023) reported that in Indonesia, young adult drivers had difficulty interpreting less familiar and warning signs, indicating a gap in driver 'training and

understanding of signage. Similarly, Ahmed et al. (2022) found that even adult drivers in Dhaka, Bangladesh demonstrated only moderate comprehension of traffic signs. These findings highlight that licensed drivers' limited understanding of signage continues to be a global road safety concern.

In the Philippines, challenges in road safety education and drivers' comprehension of traffic signs are well documented. A study by Robielos and Lin (2022) involving both drivers and non-drivers in Metro Manila found that 27 out of 73 traffic signs failed to meet the minimum 67% comprehension standard, indicating that a significant number of licensed drivers struggle with recognizing and interpreting traffic signs, despite formal driver education and licensing requirements. This suggests that existing road safety education programs and driver training may be insufficient in equipping drivers with the necessary knowledge. Furthermore, Fernandez et al. (2020) noted that Filipino drivers often misunderstand key traffic signs and traffic rules, which contributes to unsafe driving practices. These national findings point to a deficiency in the effectiveness of road safety education and sign training for licensed drivers.

Locally, in Toril District, Davao City, licensed drivers encounter various regulatory, warning, and informational road signs during their daily travel. The Davao City Transport and Traffic Management Office (CTTMO) have implemented road signage installations to improve road safety and traffic flow (Abude, as cited in SunStar Davao, 2023). However, despite these efforts, there is limited empirical evidence on the level of road safety education and knowledge of road signs among licensed drivers in Toril District. More importantly, existing studies have not sufficiently examined whether road safety education is related to and can predict drivers' knowledge of road signs in this local context. This gap warrants a localized investigation of the relationship between road safety education and knowledge of road signs among licensed drivers in Toril District, Davao City. The findings may provide evidence for strengthening driver education and road safety interventions, particularly in areas where knowledge of road signs remains limited.

Research Questions

This study aimed to determine the influence of road safety education and the level of knowledge of road users on road signs among licensed drivers in Toril District, Davao City.

Specifically, this study sought to answer the following questions:

1. What is the level of road safety education among road users in Toril District, Davao City in terms of:
 - 1.1 Theoretical Driving Course;
 - 1.2 Practical Driving Course;
 - 1.3 Automated Driving Course; and
 - 1.4 Practical Driving Test?
2. What is the level of knowledge of road users on road signs in terms of:
 - 2.1 Regulatory Signs;
 - 2.2 Warning Signs; and
 - 2.3 Guide Signs?
3. Is there a significant relationship between road safety education and the level of knowledge of road users on road signs?
4. Does road safety education significantly influence the level of knowledge of road users on road signs?

Scope and Delimitation of the Study

This study focused on road safety education and the knowledge of road users on road signs among licensed drivers in Toril District, Davao City. Specifically, the study covered road safety education in terms of the theoretical driving course, practical driving course, automated driving course, and practical driving test. This also assessed drivers' knowledge of regulatory, warning, and guide signs based on the standard road signs issued by the Land Transportation Office (LTO) and the Department of Public Works and Highways (DPWH). Furthermore, this study determined the level of road safety education, the level of road signage knowledge, the relationship between these variables, and the influence of road safety education on drivers' interpretation of road signs. Further, this study used descriptive, correlational, and predictive research designs under a quantitative approach. The respondents included licensed drivers of different ages, educational levels, and driving experiences who actively use public roads within the district during the conduct of the study. However, this study was limited only to licensed drivers in Toril District, Davao City. Non-drivers, unlicensed drivers, student's permit holders, and drivers with expired or invalid licenses are excluded from the study. Finally, this study does not cover actual driving behavior, traffic violations, or accident involvement.

Literature Review

Road Safety Education

Road safety education is an important component of driver development because it equips road users with the knowledge, skills, and attitudes needed to understand traffic regulations, recognize road hazards, interpret traffic signs, and make appropriate driving decisions. Effective driver education extends beyond basic driving skills and includes continuous development of knowledge, risk awareness, hazard perception, and responsible road behavior. Akbari et al. (2021) found that both pre-licensing and post-licensing driver education improve driving performance, perceived competence, and adherence to road safety practices. Similarly, Faus et al. (2022) emphasized that driver education is more effective when it focuses on behavioral change, risk awareness, and hazard perception, while Forster et al. (2024) demonstrated that hazard perception training improves drivers' ability to identify and appropriately respond to road hazards. These findings indicate that road safety education strengthens the cognitive competencies necessary for interpreting traffic information and making safe driving decisions, although its effectiveness depends on the content and continuity of training. This is particularly relevant to road sign knowledge, which requires drivers not only to recognize signs but also to interpret and apply their meanings in actual traffic situations. In the Philippine context, road safety education is reflected in the Theoretical Driving Course (TDC), Practical Driving Course (PDC), Automated Driving Course (ADC), and Practical Driving Test, which collectively provide theoretical knowledge, practical application, technology-supported learning, and competency assessment. Examining these components together provides a comprehensive basis for understanding how road safety education may contribute to drivers' knowledge of road signs.

Theoretical Driving Course

The Theoretical Driving Course (TDC) provides foundational knowledge on traffic laws, road signs, defensive driving, road courtesy, and responsible road use. It is designed to establish the cognitive foundation necessary before an individual operates a motor vehicle on public roads. Research supports the importance of structured theoretical instruction in developing drivers' knowledge and risk awareness. Akbari et al. (2021) reported that structured driver education improves knowledge of traffic regulations, driving competence, and compliance with road safety practices. Faus et al. (2022) similarly emphasized the value of educational programs that incorporate road safety concepts, hazard awareness, and behavioral change (Forster, et al., 2024) further showed that targeted education can improve drivers' hazard perception and their ability to respond appropriately to potential hazards. Taken together, these studies indicate that theoretical instruction provides an essential knowledge base for safe driving. However, acquiring information during formal instruction does not necessarily guarantee that drivers will retain or correctly apply such knowledge after obtaining a license. This distinction is important because the present study focuses on licensed drivers, for whom road sign knowledge may be influenced by continued exposure to actual traffic conditions after formal driver education.

Practical Driving Course

The Practical Driving Course (PDC) complements theoretical instruction by allowing learners to apply traffic rules and road safety concepts in actual or simulated driving situations. It develops vehicle control, situational awareness, hazard recognition, decision-making, and appropriate responses to traffic conditions. Prabhakaran et al. (2024) found that hazard perception training produces meaningful improvements in drivers' ability to detect potential hazards, particularly when learners are actively engaged in realistic situations. Similarly, Krasniuk et al. (2024) reported that simulator-based practical training improves driving skills and safety outcomes among novice drivers. Habibzadeh Omran et al. (2023) also identified hazard perception as a critical component of safe driving and emphasized the importance of continued training and standardized assessment. The literature therefore suggests that practical experience strengthens the application of theoretical knowledge. Nevertheless, practical competence and knowledge of road signs are related but distinct aspects of driving. A driver may demonstrate adequate vehicle control while still experiencing difficulty in recognizing or interpreting specific traffic signs. Thus, examining road sign knowledge separately remains necessary, particularly among licensed drivers who have already progressed beyond formal driver training.

Automated Driving Course

The Automated Driving Course (ADC) represents a technology-supported component of driver education that can use digital platforms, simulations, and interactive learning activities to expose learners to different traffic situations. Such approaches provide controlled environments in which drivers can repeatedly encounter hazards, traffic information, and decision-making situations without the risks associated with actual

road exposure. Prabhakharan et al. (2024) demonstrated the value of interactive hazard perception training, while Krasniuk et al. (2024) found that simulator-based instruction can improve driving skills and safety outcomes among novice drivers. Ghosh Tusti et al. (2025) further reported that technology-enhanced driver education can support hazard anticipation, attention management, and overall driving competence. These studies demonstrate the potential of technology-supported instruction to reinforce knowledge and cognitive driving skills. However, most of the available evidence focuses on training effectiveness, hazard perception, or novice drivers rather than on the retention and application of road sign knowledge among already licensed drivers. This limitation highlights the need to examine whether exposure to formal and technology-supported driver education is reflected in actual knowledge of road signs among drivers operating in specific local road environments.

Practical Driving Test

The Practical Driving Test provides a performance-based assessment of whether a learner has acquired the competencies required for safe independent driving. It evaluates areas such as vehicle control, compliance with traffic regulations, decision-making, and responses to road conditions. Bellagamba et al. (2020) identified on-road assessment as an important approach for evaluating driving fitness because it captures driving performance under realistic conditions. Akbari et al. (2021) likewise emphasized that driver education and assessment serve different but complementary purposes: education develops knowledge and skills, while assessment determines whether these competencies have been acquired. Krasniuk et al. (2024) further demonstrated that practical and simulator-supported training can improve driving performance and safety outcomes. Although practical testing provides evidence of driving competence, passing a driving test does not necessarily establish long-term retention of all road safety knowledge. Drivers continue to encounter changing traffic environments, road layouts, and traffic signs after licensing. Consequently, assessing the knowledge of licensed drivers provides an opportunity to determine whether road safety education continues to be reflected in their understanding of road signs beyond the licensing process.

Knowledge of Road Users

Knowledge of road signs involves the ability of road users to recognize, interpret, and understand traffic signs and to associate these signs with appropriate driving responses. It is an important component of safe road use because signs communicate regulations, warnings, directions, and other information necessary for navigation and decision-making. Atombo et al. (2020) found that familiarity and comprehension of traffic signs are associated with greater compliance with traffic regulations. Papadimitriou et al. (2023) similarly reported that sign clarity, consistency, familiarity, and design influence drivers' comprehension of traffic information. Prabhakharan et al. (2024) further indicated that structured training can improve traffic sign recognition and hazard perception. The literature indicates that road sign knowledge is influenced by both driver-related factors, such as education, familiarity, exposure, and hazard perception, and sign-related factors, such as clarity, consistency, and design. Thus, knowledge of road signs cannot be viewed solely as a product of memorizing traffic symbols. It also involves the ability to process visual information and connect it with appropriate road behavior. This provides a basis for examining specific categories of road signs among licensed drivers.

Regulatory Signs

Regulatory signs communicate mandatory instructions, restrictions, and prohibitions that road users are expected to follow. Correct recognition and interpretation of these signs are therefore directly related to compliance with traffic regulations. Chae et al. (2020) demonstrated that traffic safety signs and their appropriate placement can influence road safety outcomes, including crash severity. Papadimitriou et al. (2023) further showed that drivers' comprehension is affected by the clarity, consistency, familiarity, and design of traffic signs. Prabhakharan et al. (2024) added that structured driver education and hazard perception training can strengthen drivers' ability to recognize and respond to traffic information. These findings collectively indicate that regulatory sign knowledge depends on both adequate education and the driver's ability to process and apply the information communicated by the sign. However, existing studies have generally examined traffic sign comprehension in broader populations or in relation to sign design and driver training. There remains limited evidence regarding the extent to which licensed drivers in a specific Philippine locality retain and demonstrate knowledge of regulatory signs.

Warning Signs

Warning signs inform drivers of potential hazards and allow them to adjust their speed, attention, and driving behavior before reaching a hazardous condition. Their effectiveness depends on the driver's ability to notice and correctly interpret the warning information. Mayhorn et al. (2021) emphasized the importance of

warning communication in helping individuals recognize hazards and make appropriate safety decisions. Prabhakaran et al. (2024) similarly found that hazard perception training strengthens the ability to identify and respond to hazardous traffic situations, while Krasniuk et al. (2024) demonstrated that practical and simulator-based training can improve hazard recognition and situational awareness. The findings suggest that warning sign knowledge is closely connected with hazard perception and the ability to translate visual information into an appropriate driving response. However, previous research has placed considerable emphasis on hazard perception training and simulated driving rather than directly assessing the knowledge of warning signs among licensed drivers in a localized setting. This creates a need for empirical evidence on whether licensed drivers possess adequate knowledge of warning signs encountered in their everyday driving environment.

Guide Signs

Guide signs provide directional, route, destination, and other informational cues that assist drivers in navigating road networks. Effective guide signs should communicate information clearly and efficiently without creating unnecessary cognitive demands. Papadimitriou et al. (2023) emphasized that clarity, consistency, familiarity, and readability influence drivers' understanding of traffic signs. Oviedo-Trespalacios et al. (2020) likewise noted that excessive visual information in the driving environment can increase cognitive workload and affect information processing. Prabhakaran et al. (2024) further showed that driver education and hazard perception training can improve the interpretation of traffic information. These studies demonstrate that guide sign comprehension depends on the interaction between the characteristics of the sign and the cognitive capabilities of the driver. Although previous research has examined sign design, information processing, and driver training, less attention has been given to the actual level of guide sign knowledge among licensed drivers within a specific Philippine district. Assessing this knowledge is particularly relevant in areas where drivers regularly encounter different types of directional and informational signs.

Methodology

Research Design

This study employed quantitative descriptive-correlational and predictive research designs. These designs were used to determine the level of road safety education and the level of knowledge of road users regarding road signs in Toril District, Davao City. The study utilized a quantitative approach to ensure objectivity through the collection of numerical data and the application of statistical analyses (Creswell & Creswell, 2023). A descriptive-correlational design was employed to describe the levels of road safety education and knowledge of road users on road signs and to examine the relationship between these variables without manipulating them. Furthermore, a predictive research design using linear regression analysis was employed to determine the influence of road safety education on road users' knowledge of road signs (Siedlecki, 2020; Field, 2018).

Research Locale

The study was conducted in Toril District, Davao City, among licensed drivers who regularly navigated the district's roadways. Toril was one of the busiest commercial and transportation areas in Davao City, characterized by markets, transport terminals, educational institutions, and major road networks where drivers regularly encountered regulatory, warning, and guide signs. The district was selected because it represented a real-world driving environment in which licensed drivers routinely interacted with traffic signs, making it an appropriate locale for assessing their knowledge and comprehension of road signs and their implications for road safety.

Research Participants

The study involved 150 licensed drivers in Toril District, Davao City, who actively used public roads and possessed a valid driver's license. The respondents were selected because they had completed the required driver education and licensing process and regularly encountered road signs while driving. Licensed drivers were considered appropriate participants because they could provide relevant and reliable information regarding their level of road safety education and knowledge of road signs. The sample size of 150 respondents was considered adequate to generate meaningful statistical results and address the objectives of the study (Creswell & Creswell, 2023).

Research Instrument

This study utilized a structured researcher-made questionnaire as the primary research instrument to measure the level of road safety education and the knowledge of licensed drivers regarding road signs in Toril

District, Davao City. The instrument consisted of two parts. The first part measured road safety education through four indicators: Theoretical Driving Course, Practical Driving Course, Automated Driving Course, and Practical Driving Test, comprising twenty (20) items rated using a four-point Likert scale ranging from 1 – Strongly Disagree (SD) to 4 – Strongly Agree (SA). The second part assessed the respondents' knowledge of road signs through a twenty-item knowledge test consisting of regulatory, warning, and guide signs. Each correct answer was assigned one (1) point, while incorrect or unanswered responses received zero (0), with higher scores indicating greater knowledge of road signs. The instrument consisted of forty (40) items and underwent content validation by a panel of experts. After incorporating the validators' recommendations, the instrument was pilot tested among licensed drivers who were not included in the actual study. The Road Safety Education scale obtained a Cronbach's alpha coefficient of 0.908, indicating excellent internal consistency, while the Knowledge of Road Signs test yielded a Kuder–Richardson Formula 20 (KR-20) reliability coefficient of 0.963, indicating excellent reliability for a dichotomously scored knowledge test. Furthermore, ethical considerations were rigorously upheld throughout the study, including the acquisition of informed consent, assurance of participant anonymity, secure handling of data, and adherence to the provisions of the Data Privacy Act of 2012 and the guidelines set by the Philippine Health Research Ethics Board (PHREB).

Data Gathering Procedure

The researchers first secured an approved letter from the research adviser, which served as authorization to conduct the study. Thereafter, a request letter was submitted to the appropriate authorities to seek permission to conduct the research among licensed drivers in Toril District, Davao City. Upon approval, the researchers identified qualified respondents based on the established inclusion criteria. Before the administration of the questionnaire, the purpose of the study was explained to the respondents, and informed consent was obtained to ensure their voluntary participation. The respondents were likewise informed that their responses would be treated with utmost confidentiality and used solely for academic and research purposes. The researcher-administered questionnaires were then personally distributed to the respondents, and sufficient time was provided for them to complete the instrument. The researchers remained available throughout the data collection process to clarify instructions and answer any questions raised by the respondents. After the completion of the survey, all questionnaires were immediately retrieved, checked for completeness, and organized for coding, tabulation, statistical analysis, and interpretation of the results.

Results and Discussions

Research Question 1: What is the level of road safety education among road users in Toril District, Davao City in terms of Theoretical Driving Course, Practical Driving Course, Automated Driving Course, and Practical Driving Test?

Table 1. Level of road safety education among road users in Toril District, Davao City in terms of Theoretical Driving Course

Statements	Mean	Verbal Description	Interpretation
1. The theoretical driving course provided me adequate classroom instruction on traffic rules during my driving education.	3.58	Strongly Agree	Highly Effective
2. The theoretical driving course helped me understand the meanings and purposes of road signs and markings.	3.66	Strongly Agree	Highly Effective
3. The theoretical driving course instilled responsibilities and obligations to licensed drivers through formal instruction.	3.67	Strongly Agree	Highly Effective
4. The theoretical driving course provided valuable driving course through simulation-based drivers safety.	3.60	Strongly Agree	Highly Effective
5. The theoretical driving course taught me focus and the consequences of my act.	3.70	Strongly Agree	Highly Effective
Over-all Mean	3.65	Strongly Agree	Highly Effective

Table 1 shows that the Theoretical Driving Course obtained an overall mean of 3.65, verbally described as Strongly Agree and interpreted as Highly Effective. This indicates that respondents perceived the course as effective in developing their understanding of traffic rules, road signs, driver responsibilities, and road safety. Among the indicators, focusing on driving and understanding the consequences of one's actions obtained the

highest mean ($M = 3.70$), followed by driver responsibilities ($M = 3.67$), understanding the meanings and purposes of road signs ($M = 3.66$), simulation-based safety instruction ($M = 3.60$), and classroom instruction on traffic rules ($M = 3.58$). Overall, the findings indicate that respondents perceived the Theoretical Driving Course as highly effective in strengthening the knowledge and awareness necessary for safe and responsible driving.

This finding supports previous studies emphasizing the importance of theoretical driver education in improving road safety knowledge and promoting safe driving behavior. Useche et al. (2023) reported that road safety education enhances drivers' awareness, risk perception, and compliance with traffic regulations, contributing to safer driving practices. Likewise, Sagberg et al. (2015) concluded that structured driver education provides essential knowledge and skills that support responsible driving behavior, although continuous reinforcement through practical experience remains necessary to sustain safe driving practices. These findings suggest that the Theoretical Driving Course serves as a strong foundation for road users by increasing their understanding of traffic regulations and encouraging responsible driving behavior.

Table 2. Level of road safety education among road users in Toril District, Davao City in terms of Practical Driving Course

	Statements	Mean	Verbal Description	Interpretation
1.	I was given sufficient hands-on driving practice under the supervision of a qualified instructor.	3.58	Strongly Agree	Very High level of Competency
2.	I developed safe driving habits on public roads.	3.76	Strongly Agree	Very High level of Competency
3.	I learned how to properly respond to common traffic situations during actual driving practice.	3.62	Strongly Agree	Very High level of Competency
4.	I exhibit confidence and control while operating vehicle.	3.72	Strongly Agree	Very High level of Competency
5.	I consistently adopted safe driving behavior.	3.66	Strongly Agree	Very High level of Competency
	Over-all Mean	3.64	Strongly Agree	Very High level of Competency

Table 2 shows that the Practical Driving Course obtained an overall mean of 3.64, verbally described as Strongly Agree and interpreted as having a Very High Level of Competency. This indicates that respondents reported a high level of practical driving competence and safe driving behavior. Among the indicators, developing safe driving habits on public roads obtained the highest mean ($M = 3.76$), followed by confidence and control while operating a vehicle ($M = 3.72$), consistently adopting safe driving behavior ($M = 3.66$), responding appropriately to common traffic situations ($M = 3.62$), and receiving sufficient supervised hands-on driving practice ($M = 3.58$). Overall, the findings indicate that respondents demonstrated a very high level of competency in practical driving skills and safe driving practices.

The findings are consistent with recent literature emphasizing that practical driver education improves behind-the-wheel performance, self-perceived driving ability, and safe driving behavior when combined with structured instruction and supervised practice. Akbari et al. (2021) concluded that driver education contributes positively to driving performance, practical skills, and compliance with traffic regulations, although continuous practice is necessary to maximize its long-term safety benefits. Likewise, Watson-Brown et al. (2020) highlighted that formal practical driving instruction strengthens vehicle control, situational awareness, and the ability to manage real-world traffic situations, thereby supporting the development of competent and responsible drivers. These findings suggest that the Practical Driving Course provides learners with essential hands-on experiences that reinforce theoretical knowledge and promote safer driving practices.

Table 3. Level of road safety education among road users in Toril District, Davao City in terms of Automated Driving Course

Statements	Mean	Verbal Description	Interpretation
1. I completed an automated or computer-based driving course as part of my driving education.	3.51	Strongly Agree	Highly Knowledgeable
2. I learned traffic rules through the automated driving course.	3.60	Strongly Agree	Highly Knowledgeable
3. I learned about traffic situations using visual examples in the automated driving course.	3.55	Strongly Agree	Highly Knowledgeable
4. I learned to recognize and understand road signs in the automated driving course.	3.62	Strongly Agree	Highly Knowledgeable
5. I learned how road safety rules apply to actual driving situations through the automated driving course.	3.66	Strongly Agree	Highly Knowledgeable
Over-all Mean	3.59	Strongly Agree	Highly Knowledgeable

Table 3 shows that the Automated Driving Course obtained an overall mean of 3.59, verbally described as Strongly Agree and interpreted as Highly Knowledgeable. This indicates that respondents reported a high level of knowledge gained through automated or computer-based driver education. Among the indicators, applying road safety rules to actual driving situations obtained the highest mean ($M = 3.66$), followed by recognizing and understanding road signs ($M = 3.62$), learning traffic rules ($M = 3.60$), understanding traffic situations through visual examples ($M = 3.55$), and completing an automated or computer-based driving course ($M = 3.51$). Overall, the findings indicate that respondents reported a high level of knowledge regarding traffic rules, road signs, and the application of road safety concepts through automated driving instruction.

The findings support recent studies emphasizing that digital and computer-based driver education effectively enhances learners' knowledge of traffic regulations, hazard awareness, and road safety concepts when integrated with interactive instructional strategies. Akbari et al. (2021) concluded that driver education programs, including technology-assisted learning, improve drivers' knowledge and promote safer driving behavior, particularly when combined with practical driving experience. Likewise, Useche et al. (2023) reported that road safety education strengthens risk perception, traffic rule compliance, and safety awareness; however, theoretical and digital instruction alone may be insufficient to develop higher-order driving skills without supervised practical application. These findings suggest that automated driver education serves as an effective foundation for road safety learning but is most beneficial when complemented by hands-on driving experiences.

Table 4. Level of road safety education among road users in Toril District, Davao City in terms of Practical Driving Test

Statements	Mean	Verbal Description	Interpretation
1. The practical driving test assessed my ability to apply road safety rules while driving.	3.51	Strongly Agree	Highly Proficient
2. The practical driving test required me to demonstrate proper use of road signs and traffic signals.	3.60	Strongly Agree	Highly Proficient
3. The practical driving test helped ensure that I was ready to drive safely on public roads.	3.55	Strongly Agree	Highly Proficient
4. The evaluation during the driving test reflected real driving conditions and challenges.	3.62	Strongly Agree	Highly Proficient
5. The practical driving test contributed to my awareness of safe and responsible driving.	3.66	Strongly Agree	Highly Proficient
Over-all Mean	3.59	Strongly Agree	Highly Proficient

Table 4 shows that the Practical Driving Test obtained an overall mean of 3.59, verbally described as Strongly Agree and interpreted as Highly Proficient. This indicates that respondents reported a high level of proficiency in applying road safety rules and demonstrating responsible driving behavior during the practical driving test. Among the indicators, contributing to awareness of safe and responsible driving obtained the highest mean ($M = 3.66$), followed by reflecting real driving conditions and challenges ($M = 3.62$), demonstrating proper use of road signs and traffic signals ($M = 3.60$), ensuring readiness to drive safely on public roads ($M = 3.55$), and assessing the ability to apply road safety rules while driving ($M = 3.51$). Overall, the findings indicate that respondents reported a high level of proficiency in applying road safety rules, using road signs and traffic signals, and demonstrating safe and responsible driving practices.

The findings are consistent with recent studies emphasizing that performance-based driving assessments are essential in determining drivers' competence, hazard perception, and safe driving behavior under actual road conditions. Akbari et al. (2021) reported that practical driver assessment strengthens the effectiveness of driver education by verifying learners' ability to apply theoretical knowledge in real driving environments, thereby improving road safety outcomes. Similarly, Useche et al. (2023) emphasized that driver education programs integrating practical evaluation with theoretical instruction significantly enhance drivers' safety awareness, risk perception, and compliance with traffic regulations. These findings suggest that the Practical Driving Test plays a vital role in validating drivers' preparedness for independent driving and reinforcing responsible driving behavior, although continuous education and practical experience remain necessary to sustain safe driving practices.

Table 5. Summary of the Level of Road Safety Education Programs among Road Users in Toril District, Davao City

	Indicators	Mean	Interpretation
1.	Theoretical Driving Course	3.65	Highly Effective
2.	Practical Driving Course	3.64	Highly Effective
3.	Automated Driving Course	3.52	Highly Effective
4.	Practical Driving Test	3.72	Highly Effective
	Over-All Mean	3.62	Highly Effective

Table 5 presents the level of road safety education among road users based on four indicators: theoretical driving course, practical driving course, automated driving course, and practical driving test. The overall mean of 3.62 indicates a very high level of road safety education among the respondents. Among the indicators, Practical Driving Test obtained the highest mean of 3.72, followed by the Theoretical Driving Course with 3.65 and the Practical Driving Course with 3.64, while the Automated Driving Course obtained the lowest mean of 3.52, although it remained within the very high descriptive level. These findings suggest that the respondents perceived the road safety education components to be implemented to a very high extent, supporting previous studies that comprehensive driver education enhances road safety knowledge, driving competence, and safe driving behavior (Akbari et al., 2021; Faus et al., 2023). Overall, the results imply that effective implementation of road safety education programs plays a significant role in preparing road users to become safer and more responsible drivers.

Research Question 2: What is the level of knowledge of road users on road signs in terms of Regulatory Signs, Warning Signs, and Guide Signs?

Table 6. Summary of the Level of knowledge of road users on road signs among Road Users in Toril District, Davao City

	Indicators	Mean	Interpretation
1.	Regulatory Signs	3.07	Proficient
2.	Warning Signs	2.37	Proficient
3.	Guide Signs	2.48	Proficient
	Over-All Mean	2.64	Proficient

Table 6 presents the level of knowledge of road signs among road users in Toril District, Davao City in terms of regulatory, warning, and guide signs. The overall mean of 2.64, interpreted as Proficient, indicates that respondents demonstrated a proficient level of knowledge of road signs. Among the indicators, Regulatory Signs obtained the highest mean ($M = 3.07$), followed by Guide Signs ($M = 2.48$) and Warning Signs ($M = 2.37$). These findings indicate that respondents demonstrated stronger knowledge of regulatory signs than warning and guide signs. The results highlight the importance of continuous road safety education and practical learning activities that reinforce the recognition and interpretation of different road signs, particularly warning and guide signs, to strengthen drivers' overall road sign knowledge and support safer road use.

The findings indicate that road users demonstrate stronger knowledge of regulatory signs than warning and guide signs, likely because regulatory signs are encountered more frequently in everyday driving and are directly associated with traffic laws and enforcement. In contrast, the lower scores for warning and guide signs suggest that respondents may have limited exposure to less frequently encountered traffic situations, resulting in weaker recognition and interpretation of these signs. These findings support previous studies which reported that repeated exposure, practical driving experience, and continuous driver education significantly improve drivers' recognition, comprehension, and compliance with traffic signs, while unfamiliar or infrequently encountered signs are more likely to be misunderstood or overlooked (Akbari et al., 2021; Faus et al., 2023). The results further imply the need to strengthen road safety education by providing continuous refresher training and practical learning activities that emphasize warning and guide signs to enhance drivers' overall road sign knowledge and promote safer driving behavior.

Research Question 3: Is there a significant relationship between road safety education and the level of knowledge of road users on road signs?

Table 7. Correlation Table

	Knowledge on Road Signs			
	r	p-value	Decision on Ho at 0.05 level of significance	Interpretation
Road Safety Education	.205	.012	Reject	Significant

Table 7 presents the correlation analysis between Road Safety Education and Knowledge of Road Signs among road users. The results revealed a statistically significant positive relationship between the two variables ($r = .205$, $p = .012$). Since the computed p-value of .012 is lower than the 0.05 level of significance, the null hypothesis is rejected. Although the correlation is weak, the positive coefficient indicates that respondents with higher levels of road safety education tend to demonstrate better knowledge of road signs. The findings suggest that while road safety education contributes to improving road sign knowledge, other factors may also influence respondents' ability to recognize and interpret traffic signs.

The findings revealed a significant positive relationship between road safety education and knowledge of road signs, indicating that respondents who reported higher levels of road safety education also tended to demonstrate better knowledge of regulatory, warning, and guide signs. Although the relationship was weak, the results indicate an association between road safety education and knowledge of road signs rather than a direct causal effect. This finding is consistent with Robielos and Lin (2022), who found that drivers exhibited significantly better traffic sign comprehension than nondrivers, highlighting the relevance of familiarity with road signs and driving experience in sign recognition and interpretation.

The weak correlation further suggests that knowledge of road signs may be associated with factors beyond formal road safety education, including continuous driving experience, repeated exposure to traffic environments, and familiarity with different road signs. Therefore, the findings support the value of maintaining theoretical instruction and practical driving experiences as complementary components of road safety education, particularly in strengthening drivers' knowledge and understanding of regulatory, warning, and guide signs.

Research Question 4: Does road safety education significantly influence the level of knowledge of road users on road signs?

Table 8. Regression Table

Model	Knowledge on Road Signs				Sig.
	Unstandardized Coefficients		Standardized Coefficients	t	
	B	Standard Error	Beta		
(Constant)	1.212	.564		2.151	.033
Road Safety Education	.395	.155	.205	2.548	.012

Regression Equation: $KRS = 0.395(RSE) + 1.212$; $R = .205$, $R\text{ Square} = .042$, $F\text{-ratio} = 6.494$, $p\text{-value} = .012$

The regression analysis revealed that Road Safety Education significantly predicts Knowledge of Road Signs among road users. The regression model was statistically significant ($F = 6.494$, $p = .012$), indicating that Road Safety Education has a significant influence on respondents' knowledge of road signs. The model produced a weak positive relationship ($R = .205$) with a coefficient of determination of $R^2 = .042$, indicating

that 4.2% of the variance in Knowledge of Road Signs is explained by Road Safety Education, while 95.8% is attributable to other variables not included in the model. Furthermore, the regression coefficient ($B = .395$, $\beta = .205$) indicates that an increase in Road Safety Education corresponds to an increase in Knowledge of Road Signs, leading to the rejection of the null hypothesis.

These findings suggest that formal road safety education is predicted with drivers' knowledge of road signs through theoretical instruction and practical training, while driving experience, hazard perception, and exposure to actual traffic environments may also be related to traffic sign comprehension. Akbari et al. (2021) reported that driver education is associated with drivers' knowledge, driving performance, and self-perceived driving abilities, although education alone does not fully explain road safety outcomes. Similarly, Horswill et al. (2021) found that structured hazard perception training is associated with learners' recognition and response to roadway hazards, while Kummetha et al. (2021) emphasized the role of situation awareness and the ability to interpret traffic signs and roadway information in actual driving environments. Collectively, these findings indicate that road safety education is significantly associated with knowledge of road signs, while other factors may also be related to traffic sign comprehension. Thus, continuous practical driving experience, refresher training, and exposure to diverse traffic conditions may complement formal road safety education in supporting drivers' knowledge and understanding of road signs.

Ethical Considerations

The study addressed potential risks related to respondents' privacy, confidentiality, and voluntary participation in accordance with applicable ethical guidelines of the Department of Science and Technology–Philippine Health Research Ethics Board (DOST-PHREB) and the Commission on Higher Education (CHED). Ethical clearance was granted by the Davao Central College Research Ethics Committee (DCC REC) under Ethics Reference No. 48959827, Series REC-2026-120, covering the conduct of the study and its data collection procedures. Respondents provided informed consent and were informed of their right to participate voluntarily, decline any question, or withdraw without penalty. To protect confidentiality, data were coded and anonymized, securely stored, and accessed only by the researcher. Research records were properly disposed of after completion of the study in accordance with the approved research procedures.

Conclusion

The study concludes that road safety education among road users in Toril District, Davao City was generally at a very high level, while knowledge of road signs was at a proficient level. Among the road sign categories, respondents demonstrated higher knowledge of regulatory signs than warning and guide signs. These findings indicate that although respondents reported high levels of road safety education, their knowledge varied across different types of road signs. The study also found a significant but weak positive relationship between road safety education and knowledge of road signs. This indicates that higher levels of road safety education were associated with better knowledge of road signs, although the weak relationship suggests that other factors may also be related to respondents' knowledge. This finding is consistent with Robielos and Lin (2022) and Ben-Bassat et al. (2021), who emphasized the relevance of driver familiarity, prior learning, and traffic sign comprehension. Therefore, the findings highlight the practical need to sustain and strengthen road safety education, particularly through continuous reinforcement of knowledge of regulatory, warning, and guide signs.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed:

Land Transportation Office (LTO) and Driving Schools. They may strengthen road safety education by incorporating more structured and practical activities on regulatory, warning, and guide signs, particularly those encountered in actual driving situations. Short orientations and situational exercises may also be integrated into automated or computer-based instruction to reinforce learners' understanding of road safety concepts. **Instructors and Traffic Educators.** They may provide greater emphasis on warning signs, which obtained the lowest mean among the road sign categories. Short recall activities, sign-identification exercises, and real-life traffic scenarios may be incorporated to reinforce learners' recognition and interpretation of warning signs. **Licensed Drivers.** They may regularly review traffic rules and road signs, particularly warning and guide signs, and apply their knowledge during actual driving. Continued attention to different road sign categories may help maintain familiarity and understanding of traffic information. **Local Government Units (LGUs) and Traffic Authorities.** They may regularly assess the visibility, placement, and condition of road signs, particularly warning signs, to support drivers' recognition and interpretation of traffic information within Toril District. **Future Researchers.** They may conduct further studies examining other factors associated with knowledge of road signs, given the weak relationship between road safety education and road sign knowledge.

Future research may also examine drivers' experiences with automated, theoretical, and practical road safety education and their knowledge of specific road sign categories.

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