

A Review of Road Traffic Safety Education Programs: Current Trends, Challenges, and Proposed Application of Theory of Planned Behavior in Program Development in Vietnam

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ABSTRACT

Road traffic accidents continue to be a leading cause of death worldwide, with the World Health Organization (WHO) reporting millions of fatalities each year. These accidents frequently involve motorcyclists in Southeast Asian countries, such as Vietnam. To address this issue, various road safety strategies have been implemented globally, with road safety education being a crucial element in reducing accidents. Therefore, it is important to review the research on these traffic safety education programs to understand the strategies' effectiveness and outcomes. This study aims to provide insights into different global and Vietnam-specific road safety strategies and their associated challenges. On the basis of the issues identified in the examined traffic education programs, the theory of planned behavior (TPB) can be an effective framework for addressing these challenges. Additionally, the TPB is proposed as a practical tool to evaluate the effectiveness of current road safety education strategies. The study also includes a method for developing a road safety education program, informed by findings from the referenced studies.

Key words: theory of planned behavior, road safety education, high school student, educational program evaluation

INTRODUCTION

According to the WHO, approximately 10 million people are disabled or injured each year due to road accidents. Statistics reveal that the number of deaths from traffic crashes reaches 1.35 million annually, equivalent to nearly 3,700 deaths per day¹. In Southeast Asia, motorized two- and three-wheeler vehicles account for 43% of total road traffic deaths. In 2016, motorcycle-related fatalities constituted 73% of all motorcycle-related fatalities in Thailand and 74% in Cambodia. Additionally, young adults aged 15–34 years account for more than 60% of motorcycle-related deaths in low- and middle-income countries². Vietnam is a country in Southeast Asia with many users of this vehicle, with over 47 million motorized 2- and 3-wheelers¹. The World Health Organization (WHO) has also estimated that for every 100,000 people, 26.4 people die due to road traffic accidents¹. In addition, research by Vu and Man Nguyen³ shows an increasing trend of road accidents involving children in Ho Chi Minh City, highlighting the pressing nature of road safety issues in Vietnam, especially concerning young individuals.

Numerous countries, such as Canada⁴, Russia⁵, and Thailand⁶, have implemented diverse road safety

strategies aimed at reducing road accidents. Among these strategies, road safety education is considered a key element in mitigating the risk of traffic fatalities among young drivers⁷. Various studies have demonstrated the effectiveness of road safety education in promoting safe driving behaviors and understanding the risks associated with traffic violations^{8–10}.

The goal of this study is to review various studies related to the application of road safety education for reducing risky behaviors in road traffic for students and to understand the issues in these programs. To achieve this goal, this research examined the current status and issues of road safety education programs globally and in Vietnam. The study subsequently proposed a method to develop a tailored road safety education program suitable for different traffic participants and regional characteristics. This approach utilized Ajzen's theory of planned behavior (TPB)¹¹ as a scientific basis for assessing the psychological factors leading to risky behaviors and subsequently designing educational content to modify these factors. Furthermore, the approach was included in evaluating the effectiveness of the education program postimplementation for students.

LITERATURE REVIEW

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What is Road Safety Education?

Education is defined as transmitting established knowledge and skills to those lacking them¹². Road safety education (RSE) is an educational measure that emphasizes “(1) Promotion of knowledge and understanding of traffic rules and situations, (2) improvement of skills through training and experience, (3) strengthening and/or changing attitudes toward risk awareness, personal safety and the safety of other road users” (p.5)¹³. The goal of road safety education is to facilitate safe mobility in traffic, imparting necessary skills for survival, promoting safe behaviors, and fostering long-term responsibility¹³. There are numerous methods to implement road safety education, such as classroom sessions, training in outdoor and traffic settings, group discussions, and various creative techniques that can be employed for this educational purpose¹³.

Issues of road traffic safety education programs

Some studies have indicated that although road safety education strategies are effective in enhancing knowledge and thereby improving road safety behaviors, their effectiveness is still not substantial. Maulina et al.¹⁴ implemented an educational program called “Police Goes to School” (PGTS). Although participation in the program increased the frequency of safe behaviors among students, the limited duration of the education (only 1 hour) and the program being conducted only 1–2 times per year could explain why the program did not achieve the expected effectiveness in improving all aspects of traffic rule knowledge, traffic sign knowledge, attitudes toward traffic regulations, and the frequency of engaging in risky driving behaviors¹⁴.

The Road Safety LIVE intervention (LIVE) is an educational programme used in the study by Bojesen and Rayce⁹ aimed at enhancing knowledge related to risk factors, improving attitudes toward risky behaviors, and encouraging safe behaviors among secondary and high school students. The Bojesen program effectively helped students enhance their knowledge of the factors leading to injuries from drunk driving, speeding, and distraction. Moreover, the results revealed a small effect on helmet-wearing behavior while cycling among students; however, the use of seat belts while in cars was not significantly different between the control group and program participants. The reason for increased knowledge but no significant improvement in safe behaviors is that while knowledge is essential

for behavior, personal beliefs such as attitudes and intentions likely play a crucial role in whether traffic-related information and safety concerns can be translated into behavior⁹.

Rafferty and Wundersitz¹⁵ conducted a study to evaluate the effectiveness of various road safety education strategies, including indirect or holistic approaches, one-off interventions, driver training, curriculum or cross-curricular methods, and multimodal methods. The study results revealed challenges in assessing the effectiveness of road safety education strategies. Many education strategies were found to lack data, or the evaluation data were not clear enough to assess effectiveness before and after education and could be subject to bias due to social expectancy factors, thus requiring an appropriate evaluation process to measure the effectiveness of future education strategies. Education duration is also a critical issue; one-off interventions have shown limited effectiveness, whereas longer education strategies with multiple sessions may be more effective. Road safety education strategies are also noted to be relatively straightforward in targeting multiple audiences, which could pose challenges to their effectiveness. Specifically, some strategies may be effective for low-risk groups, whereas others may be ineffective or have adverse effects. Therefore, for road safety education strategies that target behavioral changes in drivers, it is essential to identify risk factors influencing behaviors and tailor interventions to individual needs. Additionally, the level of intervention should be appropriate for risk levels because intervening at a low level for high-risk individuals may be ineffective, whereas intervening at a high level for low-risk individuals could lead to negative impacts by increasing their risk levels. For adolescents, road safety education is not just about enhancing knowledge but also requires changes to develop and nurture attitudes related to using roads safely and responsibly.

Applying the theory of planned behavior in road traffic safety education

The theory of planned behavior (TPB)¹¹ is a widely accepted theory used to explain human behavior. In the TPB, attitudes, subjective norms, and perceived behavioral control are latent factors influencing performance behavior through intention. TPB has been employed in various fields, such as medicine¹⁶, education¹⁷, and services¹⁸. Many studies in the transportation field have also utilized the TPB to identify latent factors influencing the risky behaviors of traffic participants^{19–21}.

The TPB can also be applied in road safety education to identify factors influencing the adoption of risky behaviors and, subsequently, devise appropriate strategies to impact these factors, indirectly limiting risky behaviors. Additionally, the TPB can serve as a tool to assess the effectiveness of road safety education programs. According to Assailly²², although crash frequencies could be used for evaluation, these events are rare, and demonstrating statistically significant differences would require monitoring a large population over an extended period, which seems impractical. Therefore, there is a need for a measurement tool for road safety education that is easy to collect yet capable of predicting crashes. Two types of data suitable for this purpose have been suggested: (1) safety performance indicators and (2) psychological antecedents of risky behaviors such as attitudes, behavioral intentions, and beliefs. Ranaei et al.²³ developed educational content related to enhancing the execution of safe behaviors on the basis of expert opinions focusing on TPB structures and using appropriate strategies to modify them. Studies have also employed the TPB to evaluate the effectiveness of pre- and posteducation interventions among students, showing improvements in knowledge, attitudes toward behaviors, subjective norms, perceived behavioral control, intentions to perform behaviors, and actual behaviors. Furthermore, the TPB was utilized as an evaluation tool for the effectiveness of the "Traffic Weeks" education program in Riaz et al.'s study (10), providing deeper insights into program effectiveness.

Development of educational content on road traffic safety

Treviño-Siller and colleagues²⁴ conducted a study that divided the implementation of road safety education into four stages. First, socioeconomic factors at the local level, as well as road safety, risks, and the current status of local roads such as streets, sidewalks, and pedestrian areas, were identified. Behaviors such as seatbelt use, helmet wearing, pedestrian behavior on roads, drunk driving, or usage of vehicles (cars, trucks, motorcycles, and bicycles) by individuals under 18 years of age were also considered during data collection. In the second stage, this information was utilized to develop road safety education content suitable for the target audience. The study also applied "empowerment education theory," where knowledge, practice, and context were explored together from the beginning to the acquisition of new knowledge. The final two stages involved the implementation of education sessions (6 sessions, 1 session per week, 1 hour

per session) and the evaluation of the program's effectiveness (5 months after completion of the teaching sessions). The study revealed changes in the knowledge, practices, and attitudes of students. However, owing to the lack of a control group, there was ambiguity in explaining whether the observed changes were truly due to the intervention or influenced by external factors. Social biases could also impact the results of attitude-related questions.

Zhang and colleagues²⁵ applied the TPB to identify the causes leading to distracted driving behaviors. They then implemented an intervention based on rational-emotive behavior therapy (REBT) to impact the underlying factors related to distracted driving behaviors. After a week-long educational program (4 sessions, 1 session per day, 1 hour per session), participants were surveyed a second time to assess the effectiveness of the education immediately after completion, and a follow-up survey was conducted half a month later to evaluate the maintenance of the education. The results revealed a 21.1% decrease in attitude scores related to distracted driving behaviors, and subjective norms and perceived behavioral control decreased by approximately 20%. With respect to the maintenance effectiveness of the intervention, the scores for all three factors decreased in the range of 15%–20%, indicating slightly diminished maintenance effectiveness compared with the postteaching levels.

ROAD TRAFFIC SAFETY EDUCATION IN VIETNAM

Current situation

In terms of policy, the majority of widely used traffic safety strategies in Vietnam focus primarily on spreading traffic safety messages and assisting learners in fully understanding road safety rules. According to the contents of plan 417/KH-BGDĐT, which focuses on enhancing road safety education in schools from 2019–2021, the approaches to be used are almost identical to those outlined in a previous plan, 161/KH-BGDĐT, proposed in 2013. This shows that the strategy used to execute educational initiatives in Vietnam has remained mostly unchanged from previous strategies. In addition, the proposal to include road safety instruction in the school curriculum was introduced in 2013 through Resolution No. 88/NQ-CP. However, the implementation of this proposal in classroom teaching is still ongoing and is expected to be included by 2020, as stated in Resolution No. 2060/QĐ-TTg.

In terms of implementation, a review of websites and instructional videos on traffic safety education in

Vietnamese schools reveals that the majority of these initiatives take the form of propagandistic presentations delivered to all students in the schoolyard or hall. The primary focus of these presentations is typically on promoting obeying traffic laws when riding on the road. Teachers often implement safety education programs in the classroom to educate students about traffic laws, the advantages of obeying these laws, and the dangers associated with engaging in risky behaviors. However, the number of lessons is typically limited, and the focus of this education is primarily on elementary school students. Vu Hong²⁶ reported that the current state of traffic safety management in elementary schools lacks a deep level of awareness despite the presence of situational awareness campaigns and some impact. The educational content is poor, the teaching methods are simplistic, and the material resources are not fully utilized to enhance the effectiveness of training programs and educational activities.

It is evident from the aforementioned information that there have been long-standing proposals to include traffic safety instruction in the curriculum in Vietnam. However, the actual implementation of these plans continues to face several obstacles in the country. Furthermore, the education system now has constraints in terms of the presentation and execution of its curriculum. The primary objective is to enhance students' understanding of traffic regulations rather than strengthening their awareness of potential risks in road traffic. Therefore, a well-designed and reasonably constructed traffic safety education program is necessary for Vietnamese students to be aware of the dangers of performing unsafe behaviors while driving, thereby changing their own awareness and trying to perform behaviors that ensure traffic safety.

Program application in changing awareness

Despite many difficulties in implementing road safety education on roads, some studies in Vietnam have also demonstrated the impact of road safety education on changing awareness and risky driving behaviors. To clarify the impacts of social factors, as well as the inadequacies in motorcycle driving training programs in Vietnam, Chou et al.²⁷ conducted a study to evaluate the effectiveness of road safety programs conducted by Honda Vietnam Co., Ltd. (HVN). Road safety programs for HVNs are diverse and include training courses for motorcycles and car driving for traffic police from 2013–2019. The television program "ILoveVietnam", aimed at enhancing road safety

knowledge, began in 2003, with road safety classes for children and adolescents, teaching materials, and teacher training also conducted from 2008–2019. The programs were confirmed to help participants reduce risky acceptance attitudes, traffic law violations, and driving distractions. However, risk awareness and risk prediction are not different between program participants and nonparticipants.

Luu et al.²⁸, through an analysis of the attitudes and behaviors of young riders, developed a handbook to guide safe driving in risky situations for high school students in Phu Yen Province. The results showed that the instructional handbook significantly increased risk awareness among young drivers after they used this handbook.

These studies demonstrate that researchers in the area of traffic safety in Vietnam are actively working to develop and enhance traffic safety education programs to effectively alter the consciousness of those involved in traffic.

PROPOSING A DESIGN TO CONSTRUCT A ROAD TRAFFIC SAFETY EDUCATION PROGRAM

The framework

This study is based on prior research on challenges encountered when implementing road safety education programs for students in a variety of countries and considers how some studies use the TPB to build educational content, perform teaching, and assess program performance. The research developed a diagram representing the three parts of a traffic education programme (Figure 1).

Part 1 Identifying latent factors leading to risky behaviors

Proceed to collect demographic information about residents for education and details regarding the current condition of roads in the area. Additionally, gather information related to the common risk exhibited by these individuals, as well as contextual details, time, and reasons behind these behaviors in the intended program deployment area.

From the collected information, a survey questionnaire applying the TPB can be constructed and used to identify demographic factors and latent factors that significantly impact the risk of the target population in the area of interest.

Part 2 Develop road traffic safety education content

Through the analysis results from part 1, the reasons behind risky behaviors can be identified on the ba-

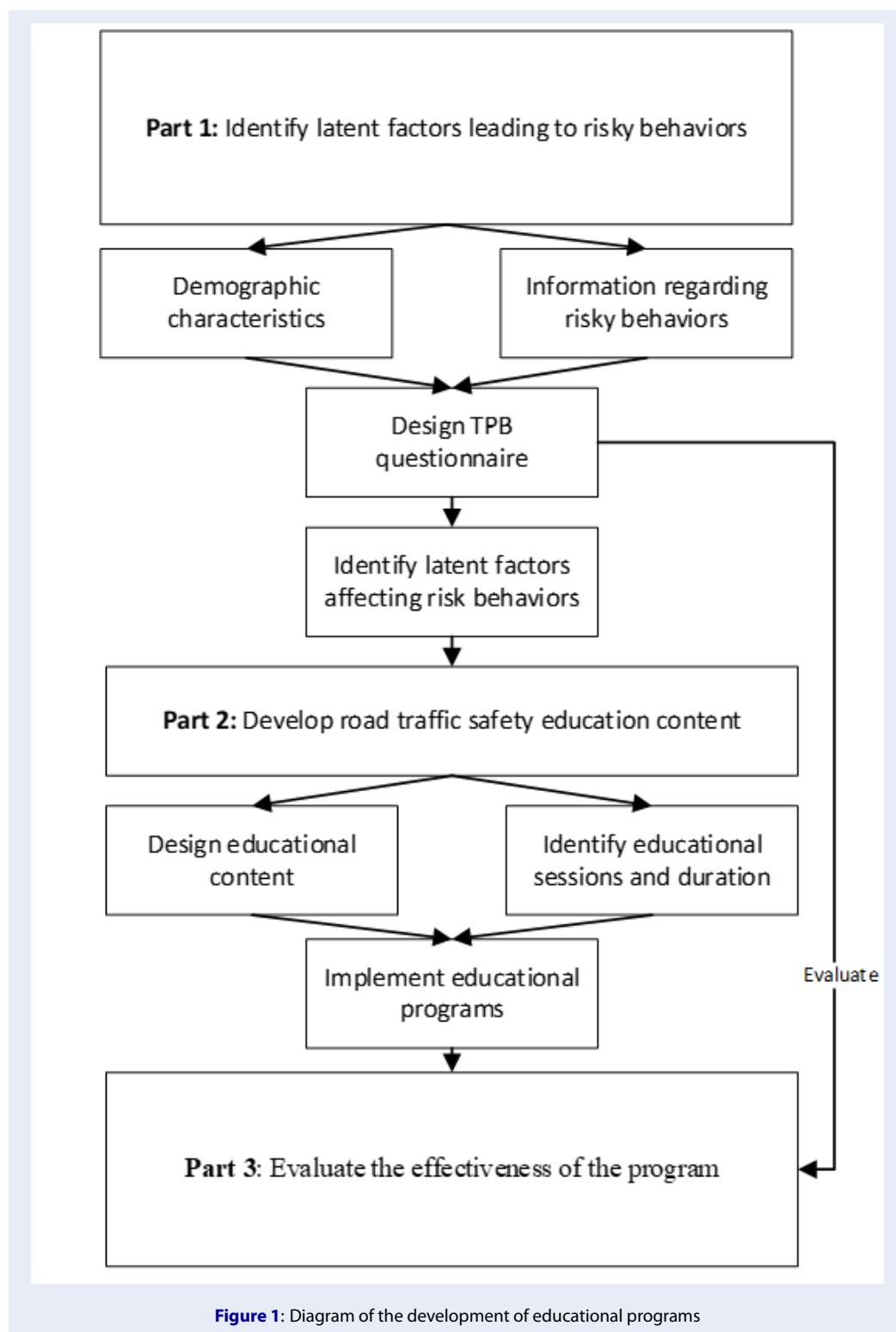


Figure 1: Diagram of the development of educational programs

sis of the TPB. Consequently, the objective of a road safety education programme is to design appropriate educational content aimed at limiting risky behaviors and enhancing safe behaviors.

The educational content should also be developed to fit within an appropriate teaching time frame, ideally not less than 1 hour. The number of sessions should be designed appropriately to avoid being too far apart between sessions, which could lead to students forgetting the knowledge from previous sessions and aligning with the implementation budget.

Part 3 Evaluate the effectiveness of the program

After completing the program implemented in part 2, the TPB can be used to assess the effectiveness of improvement among learners before and after they participate in the road safety education program.

The evaluation of the effectiveness of the program should be conducted multiple times at various intervals to assess whether the educational impacts are sustained at different points in time.

DISCUSSION

Findings in implementing road safety education programs

Road safety education, in addition to increasing awareness of traffic rules and improving safety skills, also involves changing the attitudes of vehicle operators toward engaging in risky behaviors in traffic. These three aspects are crucial components of road safety education. According to "Road Safety for Young People in Europe"⁷, these aspects are closely interrelated; knowledge without practical experience in dangerous situations does not ensure complete safety. Furthermore, knowledge and skills are useless if drivers are inclined toward risky behaviors. This aligns with referenced studies demonstrating improvements in risk-related knowledge but a limited impact on safe behaviors. Moreover, influencing underlying factors such as attitudes, beliefs, and intentions is more effective in converting learned knowledge into behavior⁹.

Additionally, the number of sessions and duration of educational programs are important factors affecting their effectiveness. One-time and short-term interventions might not be effective enough to produce impacts on sociopsychological components in students²⁹. Moreover, shortened education times can reduce program efficacy, as supported by the findings of Ukpong and George³⁰, who reported significant differences in learning outcomes between groups

with different program durations. Therefore, an educational program with an appropriate number of sessions and a reasonable duration is one of the important factors affecting the intervention effectiveness of a road traffic safety education program.

The tool for assessing the effectiveness of educational programs is also a significant concern. Raftery and Wundersitz¹⁵ highlighted issues where many educational programs lack sufficient data for evaluation or where evaluation data may be biased due to social desirability during data collection. In addition, using the frequency of traffic accidents as a value to evaluate the effectiveness of a program is impossible because traffic accident events are rare in reality²². Therefore, to evaluate the effectiveness and maintenance effectiveness of traffic safety education programs, some studies have applied the TPB as a simple and easy-to-implement tool^{25,29}.

Issues related to policy, curriculum development for road safety education and program deployment resources also arise in Vietnam. However, the effectiveness of long-term implemented road safety education programs has been demonstrated, with significant improvements in attitudes and risk perceptions and a reduced incidence of traffic law violations^{27,28}.

The importance of the TPB in building and evaluating educational programs

To identify latent factors influencing risky behaviors in traffic and thereby develop education programs that target these factors, some studies have applied the TPB in the implementation of road safety education. Through the TPB, researchers can determine how factors such as attitudes, subjective norms, perceived behavioral control, and intentions influence risky behaviors within the target sample. This information can serve as a foundation for constructing educational content aimed at identifying the key factors leading to risky behaviors. The TPB can also be used as a tool for assessing education programs more easily and quickly than traditional methods (based on long-term traffic accident frequencies). However, it is important to consider factors such as social desirability bias, time, survey context, and various other factors that may affect the relationship between latent factors and actual risky behaviors, leading to discrepancies between internal thoughts and external behaviors³¹.

Proposing a method for building educational programs

The study also proposes stages for developing a road safety education program supported by the TPB. In

the initial stage, the TPB can be applied to identify the latent factors leading to risky/safe behaviors within the target group. In the second stage, on the basis of insights into the causes of these behaviors, educational content can be designed and developed through consultations with education experts or structured within a theoretical framework to impact the identified latent factors. In the third stage, the effectiveness and sustainability of the road safety education program can be evaluated at different intervals via the TPB.

This method confirms the most impactful factors influencing risky/safe behaviors in a specific area of interest, allowing resources to be efficiently directed toward reducing unfavorable factors or enhancing beneficial ones to mitigate these behaviors. Additionally, compared with traditional methods, which rely on changes in the frequency of traffic accidents in the deployment area, methods that assess effectiveness post-education completion and long-term efficacy can be conducted more easily and quickly.

CONCLUSION

In addition to explaining the definition of road safety education, this study highlights the challenges faced in implementing road safety education programs globally and in Vietnam. Furthermore, the research emphasized that the TPB is a useful tool not only for identifying the causes leading to risky behaviors of participants in traffic but also for determining the cause of traffic accidents.

The findings and proposals of this study are expected to help elucidate ongoing issues in road safety education and provide a method for conceptualizing the development and implementation of road safety education programs for students in Vietnam.

ABBREVIATIONS

None.

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None.

AUTHOR'S CONTRIBUTIONS

All authors equally contributed to this work, read and approved the final manuscript.

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AVAILABILITY OF DATA AND MATERIALS

Not applicable.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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