

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

1 INTRODUCTION

2 According to the WHO, approximately 10 million
3 people are disabled or injured each year due to road
4 accidents. Statistics reveal that the number of deaths
5 from traffic crashes reaches 1.35 million annually,
6 equivalent to nearly 3,700 deaths per day¹. In South-
7 east Asia, motorized two- and three-wheeler vehi-
8 cles account for 43% of total road traffic deaths. In
9 2016, motorcycle-related fatalities constituted 73% of
10 all motorcycle-related fatalities in Thailand and 74%
11 in Cambodia. Additionally, young adults aged 15–
12 34 years account for more than 60% of motorcycle-
13 related deaths in low- and middle-income countries².
14 Vietnam is a country in Southeast Asia with many
15 users of this vehicle, with over 47 million motorized
16 2- and 3-wheelers¹. The World Health Organization
17 (WHO) has also estimated that for every 100,000 peo-
18 ple, 26.4 people die due to road traffic accidents¹. In
19 addition, research by Vu and Man Nguyen³ shows an
20 increasing trend of road accidents involving children
21 in Ho Chi Minh City, highlighting the pressing nature
22 of road safety issues in Vietnam, especially concern-
23 ing young individuals.
24 Numerous countries, such as Canada⁴, Russia⁵, and
25 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 demon-
strated 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 re-
lated 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 pro-
posed a method to develop a tailored road safety ed-
ucation program suitable for different traffic partici-
pants and regional characteristics. This approach uti-
lized 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. Further-
more, the approach was included in evaluating the ef-
fectiveness of the education program postimplemen-
tation for students.

LITERATURE REVIEW

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51 **What is Road Safety Education?**

52 Education is defined as transmitting established
53 knowledge and skills to those lacking them¹². Road
54 safety education (RSE) is an educational measure that
55 emphasizes “(1) Promotion of knowledge and under-
56 standing of traffic rules and situations, (2) improve-
57 ment of skills through training and experience, (3)
58 strengthening and/or changing attitudes toward risk
59 awareness, personal safety and the safety of other road
60 users” (p.5)¹³. The goal of road safety education is
61 to facilitate safe mobility in traffic, imparting neces-
62 sary skills for survival, promoting safe behaviors, and
63 fostering long-term responsibility¹³. There are nu-
64 merous methods to implement road safety education,
65 such as classroom sessions, training in outdoor and
66 traffic settings, group discussions, and various cre-
67 ative techniques that can be employed for this edu-
68 cational purpose¹³.

69 **Issues of road traffic safety education pro-**
70 **grams**

71 Some studies have indicated that although road safety
72 education strategies are effective in enhancing knowl-
73 edge and thereby improving road safety behaviors,
74 their effectiveness is still not substantial. Maulina
75 et al.¹⁴ implemented an educational program called
76 “Police Goes to School” (PGTS). Although participa-
77 tion in the program increased the frequency of safe
78 behaviors among students, the limited duration of the
79 education (only 1 hour) and the program being con-
80 ducted only 1–2 times per year could explain why the
81 program did not achieve the expected effectiveness in
82 improving all aspects of traffic rule knowledge, traffic
83 sign knowledge, attitudes toward traffic regulations,
84 and the frequency of engaging in risky driving behav-
85 iors¹⁴.

86 The Road Safety LIVE intervention (LIVE) is an edu-
87 cational programme used in the study by Bojesen and
88 Rayce⁹ aimed at enhancing knowledge related to risk
89 factors, improving attitudes toward risky behaviors,
90 and encouraging safe behaviors among secondary and
91 high school students. The Bojesen program effectively
92 helped students enhance their knowledge of the fac-
93 tors leading to injuries from drunk driving, speed-
94 ing, and distraction. Moreover, the results revealed a
95 small effect on helmet-wearing behavior while cycling
96 among students; however, the use of seat belts while in
97 cars was not significantly different between the con-
98 trol group and program participants. The reason for
99 increased knowledge but no significant improvement
100 in safe behaviors is that while knowledge is essential

101 for behavior, personal beliefs such as attitudes and in-
102 tentions likely play a crucial role in whether traffic-
103 related information and safety concerns can be trans-
104 lated into behavior⁹.

105 Raftery and Wundersitz¹⁵ conducted a study to eval-
106 uate the effectiveness of various road safety education
107 strategies, including indirect or holistic approaches,
108 one-off interventions, driver training, curriculum or
109 cross-curricular methods, and multimodal methods.
110 The study results revealed challenges in assessing the
111 effectiveness of road safety education strategies.
112 Many education strategies were found to lack data,
113 or the evaluation data were not clear enough to as-
114 sess effectiveness before and after education and could
115 be subject to bias due to social expectancy factors,
116 thus requiring an appropriate evaluation process to
117 measure the effectiveness of future education strate-
118 gies. Education duration is also a critical issue; one-
119 off interventions have shown limited effectiveness,
120 whereas longer education strategies with multiple ses-
121 sions may be more effective. Road safety education
122 strategies are also noted to be relatively straightfor-
123 ward in targeting multiple audiences, which could
124 pose challenges to their effectiveness. Specifically,
125 some strategies may be effective for low-risk groups,
126 whereas others may be ineffective or have adverse ef-
127 fects. Therefore, for road safety education strategies
128 that target behavioral changes in drivers, it is essen-
129 tial to identify risk factors influencing behaviors and
130 tailor interventions to individual needs. Addition-
131 ally, the level of intervention should be appropriate
132 for risk levels because intervening at a low level for
133 high-risk individuals may be ineffective, whereas in-
134 tervening at a high level for low-risk individuals could
135 lead to negative impacts by increasing their risk lev-
136 els. For adolescents, road safety education is not just
137 about enhancing knowledge but also requires changes
138 to develop and nurture attitudes related to using roads
139 safely and responsibly.

140 **Applying the theory of planned behavior in**
141 **road traffic safety education**

142 The theory of planned behavior (TPB)¹¹ is a widely
143 accepted theory used to explain human behavior. In
144 the TPB, attitudes, subjective norms, and perceived
145 behavioral control are latent factors influencing per-
146 formance behavior through intention. TPB has been
147 employed in various fields, such as medicine¹⁶, edu-
148 cation¹⁷, and services¹⁸. Many studies in the trans-
149 portation field have also utilized the TPB to identify
150 latent factors influencing the risky behaviors of traffic
151 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

255 Vietnamese schools reveals that the majority of these
 256 initiatives take the form of propagandistic presenta-
 257 tions delivered to all students in the schoolyard or hall.
 258 The primary focus of these presentations is typically
 259 on promoting obeying traffic laws when riding on the
 260 road. Teachers often implement safety education pro-
 261 grams in the classroom to educate students about traf-
 262 fic laws, the advantages of obeying these laws, and the
 263 dangers associated with engaging in risky behaviors.
 264 However, the number of lessons is typically limited,
 265 and the focus of this education is primarily on ele-
 266 mentary school students. Vu Hong²⁶ reported that
 267 the current state of traffic safety management in ele-
 268 mentary schools lacks a deep level of awareness de-
 269 spite the presence of situational awareness campaigns
 270 and some impact. The educational content is poor,
 271 the teaching methods are simplistic, and the material
 272 resources are not fully utilized to enhance the effec-
 273 tiveness of training programs and educational activi-
 274 ties.

275 It is evident from the aforementioned information
 276 that there have been long-standing proposals to in-
 277 clude traffic safety instruction in the curriculum in
 278 Vietnam. However, the actual implementation of
 279 these plans continues to face several obstacles in the
 280 country. Furthermore, the education system now has
 281 constraints in terms of the presentation and execution
 282 of its curriculum. The primary objective is to enhance
 283 students' understanding of traffic regulations rather
 284 than strengthening their awareness of potential risks
 285 in road traffic. Therefore, a well-designed and reason-
 286 ably constructed traffic safety education program is
 287 necessary for Vietnamese students to be aware of the
 288 dangers of performing unsafe behaviors while driv-
 289 ing, thereby changing their own awareness and trying
 290 to perform behaviors that ensure traffic safety.

291 **Program application in changing aware-**
 292 **ness**

293 Despite many difficulties in implementing road safety
 294 education on roads, some studies in Vietnam have
 295 also demonstrated the impact of road safety educa-
 296 tion on changing awareness and risky driving behav-
 297 iors. To clarify the impacts of social factors, as well as
 298 the inadequacies in motorcycle driving training pro-
 299 grams in Vietnam, Chou et al.²⁷ conducted a study
 300 to evaluate the effectiveness of road safety programs
 301 conducted by Honda Vietnam Co., Ltd. (HVN). Road
 302 safety programs for HVNs are diverse and include
 303 training courses for motorcycles and car driving for
 304 traffic police from 2013–2019. The television pro-
 305 gram "ILoveVietnam", aimed at enhancing road safety

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

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

321 These studies demonstrate that researchers in the area
 322 of traffic safety in Vietnam are actively working to de-
 323 velop and enhance traffic safety education programs
 324 to effectively alter the consciousness of those involved
 325 in traffic.

326 **PROPOSING A DESIGN TO**
 327 **CONSTRUCT A ROAD TRAFFIC**
 328 **SAFETY EDUCATION PROGRAM**

329 **The framework**

330 This study is based on prior research on challenges en-
 331 countered when implementing road safety education
 332 programs for students in a variety of countries and
 333 considers how some studies use the TPB to build ed-
 334 ucational content, perform teaching, and assess pro-
 335 gram performance. The research developed a diagram
 336 representing the three parts of a traffic education pro-
 337 gramme (Figure 1).

338 **Part 2 Develop road traffic safety education**
 339 **content**

340 Through the analysis results from part 1, the reasons
 341 behind risky behaviors can be identified on the ba-
 342 sis of the TPB. Consequently, the objective of a road
 343 safety education programme is to design appropriate
 344 educational content aimed at limiting risky behaviors
 345 and enhancing safe behaviors.

346 The educational content should also be developed to
 347 fit within an appropriate teaching time frame, ideally
 348 not less than 1 hour. The number of sessions should
 349 be designed appropriately to avoid being too far apart
 350 between sessions, which could lead to students forget-
 351 ting the knowledge from previous sessions and align-
 352 ing with the implementation budget.

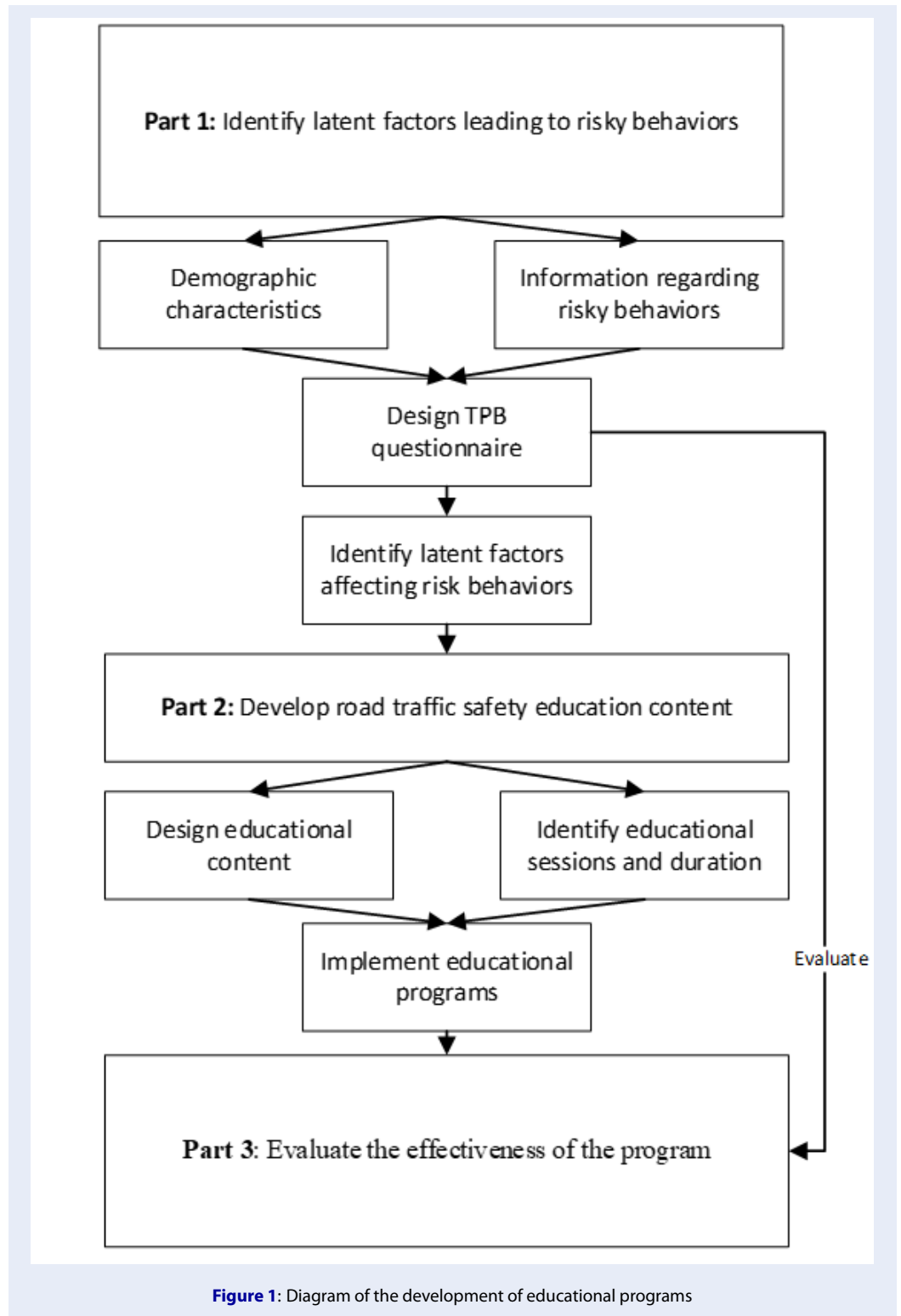


Figure 1: Diagram of the development of educational programs

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.

453 This method confirms the most impactful factors influ-
 454 fluencing risky/safe behaviors in a specific area of in-
 455 terest, allowing resources to be efficiently directed to-
 456 ward reducing unfavorable factors or enhancing ben-
 457 efitial ones to mitigate these behaviors. Additionally,
 458 compared with traditional methods, which rely on
 459 changes in the frequency of traffic accidents in the de-
 460 ployment area, methods that assess effectiveness post-
 461 education completion and long-term efficacy can be
 462 conducted more easily and quickly.

463 CONCLUSION

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

472 The findings and proposals of this study are expected
 473 to help elucidate ongoing issues in road safety edu-
 474 cation and provide a method for conceptualizing the
 475 development and implementation of road safety edu-
 476 cation programs for students in Vietnam.

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