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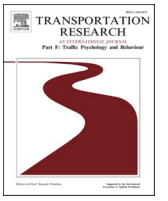

Transforming road instructor training through Attitude Change: long-term impact of a GDE-aligned Model for safe driving education

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ABSTRACT

Despite growing awareness of the human and social costs of road traffic incidents, training programmes for driving instructors often remain limited to procedural content, lacking transformative impact on attitudes and values. This study evaluates the long-term effectiveness of an educational model centred on attitudinal change, developed by the ERES'v research group at the Universitat Autònoma de Barcelona. Grounded in the upper levels of the Goals for Driver Education (GDE) matrix, the model was implemented in the official training programme for driving instructors in Catalonia, Spain.

A quasi-experimental longitudinal design was applied to an entire cohort (n = 48), with data collected at four time points: pre-test, post-test, and 6- and 48-month follow-ups. Two validated instruments (APRECONS and CPFV) measured predisposition to teach safe driving, beliefs about road risks, self-reported behaviours, and ethical commitments. Analyses included paired-samples t-tests, repeated measures ANOVA, Cochran's Q, and McNemar's test.

Results showed statistically significant and durable improvements in seven out of nine attitudinal dimensions, with notable gains in risk anticipation, emotional engagement with road safety, and long-term professional commitment. Although certain indicators declined slightly at six months, most stabilised or improved by the 48-month mark—indicating sustained internalisation.

These findings offer robust empirical support for integrating value-oriented, emotionally grounded educational models into instructor certification. The demonstrated impact over four years highlights the model's potential to redefine the role of the driving instructor—not merely as a technical trainer, but as a socially engaged educator committed to the protection of life and promotion of ethical mobility.

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1. Introduction

1.1. Limitations of traditional training

The training of road safety educators represents a strategic axis in promoting road safety and achieving a sustained reduction in traffic-related injuries and fatalities (Arnau-Sabatés & Montané-Capdevila, 2010b; Jariot-Garcia et al., 2024; Jariot-Garcia & Rodríguez-Parrón, 2007; Servei Català de Trànsit, 2021; Üzümcüoğlu et al., 2021). In the Spanish context, such training has historically focused on the acquisition of a driving licence, primarily through demonstrating instrumental competencies related to vehicle control and traffic regulation knowledge. However, recent studies consistently indicate that this narrow, skills-based approach is insufficient for producing sustainable behavioural change, especially among young drivers (Bates et al., 2019; Rodwell et al., 2018). A major limitation lies in the minimal emphasis placed on helping learners understand and internalise the relevance of risk factors—an essential component in road safety development that cannot be addressed through practical driving instruction alone (Jawi et al., 2017).

While a growing body of research recognises the need to develop more integrated and long-lasting educational approaches to road safety, existing training programmes often fall short in terms of theoretical coherence, attitudinal focus, and evaluative rigour (Rodwell et al., 2018; Bates et al., 2019). These limitations constrain their potential to meaningfully influence driving behaviours and reduce accident rates. Furthermore, mobility education should be viewed as a lifelong learning process requiring professionals who are ethically and emotionally prepared to cultivate critical awareness and sustained engagement with road safety issues.

1.2. Need for attitudinal and psychosocial approaches

Moreover, it is imperative to consider the psychosocial variability among learners, and to adapt training programs to the specific characteristics, beliefs, and developmental stages of each participant (Bates et al., 2019). One-size-fits-all pedagogical strategies fail to account for the emotional, cognitive, and attitudinal dimensions that influence road behaviour.

The literature increasingly highlights the need for road safety education to transcend normative instruction and foster value-based learning capable of catalysing enduring attitudinal transformation (AlHamad et al., 2023; European Commission, 2019; European Parliament, 2021; Tingvall & Haworth, 1999; United Nations Road Safety, 2020; World Health Organization, 2021). This reconceptualisation of the instructor's role as an ethical-pedagogical reference point has significant implications for initial teacher training. The instructor's willingness and ability to engage in emotional, cognitive, and behavioural change processes is now seen as central to the effectiveness of road safety education (Arnau-Sabatés & Montané-Capdevila, 2010a, 2010b; Callealta et al., 2020; Jariot-Garcia & Montané-Capdevila, 2014).

1.3. Redefining the role of the instructor

The term "road safety educator" itself is arguably reductive, as it fails to capture the multifaceted nature of this professional role—which encompasses ethical orientation, pedagogical innovation, and behavioural modelling. Despite their strategic importance in shaping responsible driving culture, research into the professional development, competencies, and attitudes of these educators remains limited (Barboza-Palomino et al., 2017; Jawi et al., 2017).

In this regard, the Goals for Driver Education (GDE) matrix represents a critical theoretical framework for rethinking driver education from a systemic and hierarchical perspective (Hatakka et al., 2017; Katila et al., 1996; Peräaho et al., 2003). The GDE model organises learning into four levels—from technical-operational skills (Level 1) to higher-order constructs such as lifestyle, values, and self-regulation (Level 4). Empirical evidence suggests that the highest levels of the matrix (Levels 3 and 4), which address motivational, emotional, and reflective capacities, offer the greatest potential for reducing traffic accidents and fostering safe mobility culture (European Commission, 2019).

Nonetheless, these higher levels remain significantly underrepresented in conventional driver education, reflecting a persistent misalignment between training objectives and the complex demands of real-world road environments. Aligning instructor education with the upper tiers of the GDE matrix is, therefore, both an urgent pedagogical challenge and a strategic opportunity for promoting ethically committed and sustainable driving behaviours.

1.4. The attitude change model and its pedagogical role

The convergence between the GDE framework and instructor education calls for pedagogical strategies capable of influencing the attitudinal and value-laden dimensions of teaching practice. While this need is well documented in academic literature, it has received relatively little empirical attention—particularly in terms of long-term evaluation. Scholars have called for rigorous longitudinal studies to assess how, and to what extent, attitudinal change programmes impact instructors' pedagogical orientation, behavioural consistency, and ethical engagement with road safety (Arnau-Sabatés et al., 2011, 2012, 2013; Ram & Chand, 2016).

In response to these deficiencies, a more comprehensive vision of mobility education has emerged—one that integrates psychosocial, affective, and ethical dimensions. This paradigm shift is exemplified by the attitude change model developed by Montané-Capdevila et al. (2007), which provides the theoretical and pedagogical foundation for the present study. Within this framework, the role of the road safety educator extends beyond content transmission: they are conceptualised as agents of change, attitudinal models, and mediators of reflective processes that shape driving culture. The model underscores the internalisation of core values—such as

responsibility, empathy, and respect for life—as fundamental to the development of an ethical and emotionally grounded driving pedagogy (Arnau-Sabatés et al., 2013; Jariot-Garcia & Montané-Capdevila, 2009, 2014).

1.5. Contribution of the study

The attitude change model developed by Montané-Capdevila et al. (2007), and implemented by the ERES'v research group at the Universitat Autònoma de Barcelona, represents a novel and coherent response to these gaps. Firmly aligned with the upper levels of the GDE matrix, this model integrates belief transformation, critical revision of risk behaviours, and emotional activation. Its aim is not only to foster active professional commitment to road safety education but also to encourage instructors to reassess their own driving practices. In doing so, it positions the educator as a value-driven role model whose teaching is consistent with personal behaviours and ethical standards (Arnau-Sabatés et al., 2013).

Although the theoretical relevance of this model has been established, empirical support—particularly longitudinal evidence—remains scarce. The present study addresses this void by providing quantitative, multi-phase evidence on the long-term effects of the attitude change model on instructors' predispositions, beliefs, behaviours, and professional commitments.

Consequently, this research underscores the imperative to rethink road safety educator training through pedagogical models that transcend mere rule transmission and technical instruction. Educational processes must foster genuine attitudinal change, ethical reflection, and emotional engagement. By anchoring such processes in the upper levels of the GDE matrix, we may progress towards a paradigm of instructor education that not only informs but also transforms.

1.6. Purpose and objectives

The aim of this study is to examine the longitudinal impact of an attitude change model on enhancing road safety educators' pedagogical predisposition towards teaching safe driving. Anchored within an educational rationale aligned with the upper levels of the Goals for Driver Education (GDE) matrix, the study seeks to provide empirical evidence on the model's effectiveness in transforming beliefs, behaviours, and long-term professional commitments to road safety.

This research endeavours to contribute to the consolidation of training practices capable of cultivating a professional culture grounded in risk prevention and the ethical imperative of preserving life in mobility contexts.

To fulfil this aim, the study formulates the following specific objectives:

To compare road safety educators' predisposition towards teaching safe driving before and after the implementation of the attitude change model.
To examine the effects of the attitude change model on teaching predisposition and pedagogical practices among educators through a longitudinal follow-up of up to 48 months.
To determine the influence of the attitude change model on the evolution of beliefs regarding risk factors in driving.
To identify changes in behaviours related to safe driving and to assess their persistence over time.
To analyse the impact of the model on the consolidation of teachers' conviction regarding the utility of an attitude-change-based approach.
To explore the evolution of the commitments acquired by educators after the training and to determine whether these are strengthened over time.

Collectively, these objectives are designed to assess how the attitude change model supports the consolidation of training practices in road safety education. Objective 1 and 2 provide insight into the development and persistence of pedagogical predisposition, which is critical for consistent instructional alignment. Objectives 3 and 4 examine the evolution of beliefs and behaviours, enabling a deeper understanding of internalised learning and its behavioural manifestations. Objectives 5 and 6 explore the ethical and attitudinal commitments developed through the training process, serving as indicators of sustained professional engagement. Together, these areas of inquiry reinforce the model's potential to cultivate a pedagogically sound, ethically grounded, and durable training framework for road safety educators.

2. Methodological design

2.1. Research approach and design

This study employed an explanatory quantitative approach, utilising a longitudinal quasi-experimental design without a control group. Repeated measures were applied to a single cohort of participants across multiple time points (Barreto & Lezcano, 2023; Martin et al., 2020; Seco et al., 2010). This methodological strategy enabled the sequential analysis of both immediate changes and the long-term stability of training effects derived from the attitude change model implemented with road safety educators.

The research design was grounded in established principles of longitudinal educational inquiry, as outlined by Creswell and Creswell (2022) and Tashakkori and Teddlie (2015), who emphasise the value of such designs in capturing sustained trajectories of attitudinal development over time. Accordingly, this study aimed not only to detect statistically significant variations in scores, but also to interpret the underlying processes driving the evolution of instructors' predispositions towards teaching safe mobility.

In contrast to traditional experimental designs that rely on random assignment and strict manipulation of variables, this study was

conducted within a real-world educational context involving a pre-defined participant group. This decision increased the ecological validity of the research (Tejada Betancourt, 2023). The absence of a control group is justified on ethical and equity grounds, as the intervention was part of an accredited official course to which all participants were entitled. As such, a non-probabilistic census sampling method was applied, a strategy deemed appropriate for intervention studies involving small, well-defined, and specialised populations (Creswell & Creswell, 2022).

The longitudinal design included four data collection waves: prior to the intervention (T0), immediately after its completion (T1), six months post-intervention (T2), and a long-term follow-up at 48 months (T3). This sequence made it possible to assess both the short-term impact and the durability or evolution of attitudinal changes over time, identifying patterns of consolidation or regression. The combination of in-person data collection (T0 and T1) and asynchronous digital surveys (T2 and T3) allowed researchers to gather data without disrupting participants' ongoing professional development, thereby supporting the naturalistic integrity of the longitudinal process.

Longitudinal quasi-experimental design applied in the study, comprising four 192 measurement points: baseline (T0), immediate post-intervention (T1), six-month follow193 up (T2), and 48-month follow-up (T3). The design allowed for the assessment of both 194 immediate effects and the long-term consolidation or regression of attitudinal change 195 among road safety educators Fig. 1.

Although the broader research initiative was framed within an explanatory mixed-methods design—incorporating both quantitative and qualitative components—this article focuses exclusively on the quantitative dimension. The qualitative data, consisting of open-ended responses, reflective exercises, and participant narratives, were collected to provide deeper insight into the attitudinal change process and will be analysed in subsequent publications. This analytical focus aligns with the specific aim of the present study: to evaluate the longitudinal impact of the model through statistically grounded measures.

2.2. Research context

This study was conducted within the framework of the official training programme for road safety educators, promoted by the Servei Català de Trànsit (SCT) in Catalonia, Spain. Specifically, it was aligned with public call INT/229/2017, which outlined the requirements for obtaining professional certification in road safety instruction.

The analysed training phase corresponds to the final, in-person component of the programme, delivered at the Faculty of Education Sciences of the Universitat Autònoma de Barcelona (UAB). This stage involved a total of 230 contact hours and was dedicated to the development of pedagogical, attitudinal, and technical competencies essential for training future drivers.

The programme's design, implementation, and supervision were carried out by a research team at UAB, which systematically applied an instructional model based on attitudinal change. This model engages participants' belief systems, promotes critical reflection on risk-related behaviours, and integrates emotional components into professional development. Its operational framework shaped both the course content and methodology, establishing a learning environment focused on value internalisation, commitment to road safety, and the ethical practice of driver education.

The intervention took place within the official training programme for road safety educators in Catalonia (Spain), coordinated by the Servei Català de Trànsit in collaboration with the Universitat Autònoma de Barcelona. Since 2005, over 1,000 instructors have been trained using this model, which was designed and is pedagogically led by the ERES'v research group, part of the Faculty of Education Sciences and the Department of Applied Pedagogy at the Universitat Autònoma de Barcelona. The attitude change model implemented goes beyond the regulatory requirements of the Servei Català de Trànsit by promoting the internalisation of ethical and attitudinal dimensions of road safety. Successful completion of the programme certifies participants as professional driving instructors across Spain and additionally qualifies them to train other instructors in road safety education for novice drivers. Furthermore, the model has contributed to shaping road safety policy in Catalonia, as it also underpins the educational framework for driver rehabilitation programmes targeting traffic offenders (see Sánchez-Marín, 2013).

The course was delivered in a tightly regulated training environment with a clearly bounded participant population. This setting enabled close monitoring of the sample under consistent, homogeneous conditions. Moreover, the programme's direct connection to a public authority and its formal accreditation as an official certification route confer high applied relevance to the study, as well as

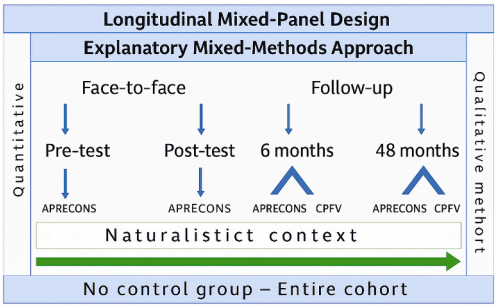

Fig. 1. Longitudinal quasi-experimental design applied in the study, comprising four measurement points: baseline (T0), immediate post-intervention (T1), six-month follow-up (T2), and 48-month follow-up (T3). The design allowed for the assessment of both immediate effects and the long-term consolidation or regression of attitudinal change among road safety educators.

substantial contextual validity for informing future improvements in public road safety education policy.

2.3. Participants and sample

The study sample consisted of the full cohort of 48 candidates (N = 48), constituting a complete census across all phases of the longitudinal study. All participants met the official entry requirement of holding at least an upper secondary education qualification (equivalent to ISCED Level 3), such as the Spanish *Bachillerato* and all had successfully passed a prior entrance examination. This ensured a homogeneous baseline in terms of motivation and core competencies necessary to engage with the training programme.

The sample exhibited a balanced gender distribution (54 % women, 46 % men) and a predominance of young adults, with 50 % aged between 25 and 34 years, 42 % between 35 and 45 years, and 8 % over 45. The territorial distribution reflected a strong concentration in the province of Barcelona (79 %), with the remaining participants residing in Girona (15 %), Lleida (4 %), and Tarragona (2 %). These sociodemographic patterns are consistent with the typical profile of road safety educators in training in the Catalan context.

In terms of professional background and driving experience, all participants were active drivers of passenger cars or vans. Additionally, 28.6 % also operated motorcycles or mopeds, while 10.2 % drove heavy vehicles. Vehicle use intensity was documented as a contextual variable to assess participants' real-world driving exposure: 32.7 % reported driving more than 30,000 km annually; 20.4 % between 21,000 and 30,000 km; 24.5 % between 16,000 and 20,000 km; and 22.4 % under 15,000 km. This high level of exposure was relevant not only for evaluating potential risk but also for exploring the consistency between professional predisposition and personal driving habits. Following certification, 79.2 % of participants reported having engaged in theoretical instruction, and 95.8 % had provided practical driving training.

To ensure longitudinal validity, a carefully designed sample retention strategy was implemented for the follow-up phases at T2 (six months) and T3 (48 months). Each wave included a one-month response window, with no additional contact between waves to prevent priming effects. The six-month follow-up achieved a 68.75 % response rate. For the 48-month follow-up, an intensive tracking effort—mainly by telephone—resulted in the full recovery of 100 % of the original cohort. This outcome was essential for avoiding sample attrition bias and preserving the internal consistency and analytical robustness of the quasi-experimental design.

2.4. Data collection instruments

To assess the study's quantitative variables, two structured instruments were employed (see Table 1). The first, a previously validated tool with established psychometric properties, was selected for its relevance in measuring key dimensions of attitudinal change within the context of road safety educator training. The second instrument was developed ad hoc for this research in order to capture constructs not addressed by existing tools. Both instruments underwent rigorous validation procedures and were explicitly aligned with the upper levels of the Goals for Driver Education (GDE) matrix and the overall objectives of the study.

Both instruments were designed to target the core components of the adopted pedagogical model—namely, beliefs, behaviours, and emotions—as foundational elements of attitudinal change.

2.4.1. APRECONS questionnaire

The Assessment Questionnaire on Predisposition for Teaching Safe Driving (APRECONS) was developed by Montané-Capdevila et al. (2021) within the framework of the ERES'v research group, which also authorised its application for the present study. The instrument consists of 52 items rated on a four-point Likert scale and distributed across nine factors measuring teachers' motivation and predisposition toward safe mobility education. The dimensions assessed include:

- Practice of safe driving
- Risk anticipation
- Motivation for teaching
- Social risk control
- Rejection of alcohol and driving
- Commitment to zero risk
- Transmission of feelings towards road safety
- Conviction regarding capacity for change

Table 1
Summary of Instruments and Psychometric Properties.

Instrument	Constructs Assessed	Item Type	Internal Reliability (α)	Content Validity	Mode of Administration
APRECONS	Predisposition towards safe driving instruction (9 factors: practice, anticipation, motivation, etc.)	52 Likert-type items (1–4 scale)	0,917	Previously validated by Montané-Capdevila et al.	Face-to-face (T0 and T1) and online (T2 and T3)
CPFV	Pedagogical conviction, teaching commitment, and beliefs regarding the model	12 dichotomous items and rating scales	—	Aiken's V = 0.93 (experts); clarity = 0.90; relevance = 0.93; importance = 0.94	Face-to-face (T1) and online (T2 and T3)

- Teaching speed control

The APRECONS instrument demonstrated excellent internal consistency (Cronbach's $\alpha = 0.917$) and discriminant validity (indices < 1), supporting its appropriateness for reliably measuring the intended constructs. Results were interpreted using categorical scales ranging from "very low" to "very high," thereby allowing for factor-specific analysis.

2.4.2. CPFV Questionnaire

The second instrument, the Questionnaire on the Training of Road Safety Educators (CPFV), was developed specifically for this study and validated through a robust expert review process. The CPFV explores pedagogical conviction, teaching commitment, and beliefs regarding the efficacy of the attitude change model. It includes a combination of closed-ended items—such as Likert-type scales and dichotomous questions—as well as some contextual and open-ended items. Despite incorporating some qualitative elements, the instrument's overall structure and analytic treatment follow a quantitative logic, enabling consistent measurement and comparison across time points.

The CPFV underwent a two-phase validation process. First, content validity was assessed through expert judgement (Escurra-Mayaute, 1969), following the methodological guidelines of Escobar-Pérez and Cuervo-Martínez (2008). Five subject-matter experts in road safety education and attitudinal training evaluated each item for clarity, relevance, and theoretical coherence. Subsequently, Aiken's V (Aiken, 1985) was applied, yielding a global content validity coefficient of V = 0.93. Subscale-specific scores confirmed the instrument's psychometric strength: clarity ($V = 0.90$), relevance ($V = 0.93$), and importance ($V = 0.94$), validating its alignment with the conceptual framework of the study.

2.4.3. Ethical considerations

Throughout the research process, ethical principles consistent with current regulations on educational research were rigorously upheld. These included voluntary participation, anonymity, confidentiality, and the right to withdraw at any time. The study followed best practice guidelines for social and educational research (Tejada Betancourt, 2023).

2.5. Data analysis strategy

Quantitative data were processed using IBM SPSS Statistics version 29. Appropriate statistical techniques were applied according to the nature of the variables (continuous or dichotomous) and the structure of the study (quasi-experimental design with repeated measures). The selection of tests (see Table 2) was directly linked to the specific evaluative objectives of the research, with careful attention to key statistical assumptions: normality (assessed via the Kolmogorov–Smirnov test), homogeneity of variances (via Levene's test), and significance thresholds set at $p < 0.05$.

3. Results

3.1. Comparison of road safety educators' predisposition towards teaching safe driving before and after the implementation of the attitude change model

Factor-level results (see Table 3) revealed that the training intervention led to statistically significant improvements across several key dimensions associated with safe driving instruction. Notably, significant gains were observed in domains related to safe driving practice, risk anticipation, social risk control, the transmission of emotional engagement with road safety, and belief in the preventability of traffic accidents. These findings suggest that the course contributed not only to knowledge acquisition but also to meaningful shifts in participants' attitudes and sensitivity regarding their professional responsibility toward safe mobility.

The most responsive dimensions corresponded to the attitudinal and emotional components of the model, reinforcing the central

Table 2
Correspondence between objectives, variables, phases, instruments, and statistical analyses.

Objective	Variables	Measurement Phases	Instrument	Data Type	Statistical Tests
1. Compare educators' predisposition before and after the intervention	Predisposition towards teaching	T0 (pre-test) / T1 (post-test)	APRECONS	Continuous Likert scale	Paired-samples Student's *t* test
2. Evaluate longitudinal evolution of predisposition and its dimensions	Beliefs regarding risk factors	T1 / T2 (6 months) / T3 (48 months)	APRECONS	Continuous Likert scale	Repeated Measures ANOVA
3. Assess beliefs about risk factors	Beliefs regarding risk factors	T1 / T2 / T3	CPFV	Dichotomous variables	Cochran's Q test
4. Identify changes in safe driving behaviours	Self-reported safe driving behaviours	T1 / T2 / T3	CPFV	Dichotomous variables	Cochran's Q test
5. Analyse teachers' conviction about the model	Pedagogical conviction regarding the model	T1 / T2 / T3	CPFV	Nominal variables	Cochran's Q test
6. Explore evolution of professional commitment	Ethical and professional commitment	T1 / T2 / T3	CPFV	Dichotomous and nominal categorical variables	Cochran's Q test / McNemar's test

Table 3
Comparison of mean scores before and after the course based on the APRECONS questionnaire – paired-samples Student's t Test.

Variables	Mean Scores		Standard Deviation	*t*	*df*	*p*
Total APRECONS Score	Pretest	178.64	10.99	−3.214	47	0.003**
	Post-test	184.36	11.75			
Safe driving practice	Pretest	32.82	3.64	−2.883	47	0.007**
	Post-test	34.67	3.46			
Risk anticipation	Pretest	22.70	2.60	−3.063	47	0.004**
	Post-test	24.15	2.62			
Motivation to teach safe driving	Pretest	30.94	1.52	−1.272	47	0.213
	Post-test	31.21	1.45			
Social risk control	Pretest	16.21	2.29	−2.418	47	0.021*
	Post-test	17.03	1.99			
Alcohol and driving	Pretest	11.18	0.95	1.955	47	0.059
	Post-test	10.91	1.28			
Commitment to zero risk	Pretest	18.61	1.39	−0.373	47	0.712
	Post-test	18.67	1.45			
Transmission of feelings	Pretest	9.58	1.77	−2.820	47	0.008**
	Post-test	10.39	1.54			
Belief in preventability (conviction)	Pretest	25.21	1.75	−2.589	47	0.014*
	Post-test	25.82	1.96			
Teaching speed control	Pretest	11.39	0.90	−0.702	47	0.488
	Post-test	11.52	0.71			

Note. $p < 0.05$ (*); $p < 0.01$ (**).

hypothesis that an attitude-based pedagogical framework activates processes of awareness and critical reflection on educators' roles in traffic safety education. Specifically, improvements in risk anticipation and in the expression of emotional values serve as salient indicators of the programme's transformative potential. These results are consistent with the pedagogical tenets of the GDE model, which places the protection of life as an overarching educational objective.

Conversely, other dimensions—such as motivation for teaching, commitment to zero risk, rejection of driving under the influence of alcohol, and speed control—did not show statistically significant changes. Although mean scores tended to increase or remained at

Table 4
One-way repeated measures ANOVA results on the improvement in predisposition towards teaching safe driving.

Variable	Time Point	Mean	Standard Deviation	Tests of within-subjects effects		
				F	*p*	Sphericity
Total APRECONS Score	Post-test	184,36	11,75	1.425	0.248	Sphericity assumed
	6 months	180,18	10,92			
	48 months	184,24	12,89			
Safe driving practice	Post-test	34,67	3,46	1.587	0.213	Sphericity assumed
	6 months	33,55	3,95			
	48 months	35,15	3,78			
Motivation to teach safe driving	Post-test	31,21	1,45	0.37	0.690	Sphericity assumed
	6 months	30,88	1,78			
	48 months	31,12	1,87			
Risk anticipation	Post-test	24,15	24,15	3.56	0.034*	Sphericity assumed
	6 months	22,97	22,97			
	48 months	24,52	24,52			
Social risk control	Post-test	17,03	1,99	2.83	0.067	Sphericity assumed
	6 months	16, 70	2,44			
	48 months	17,91	2,08			
Alcohol and driving	Post-test	14,76	1,43680	1.58	0.220	Greenhouse-Geisser
	6 months	15,12	1,05			
	48 months	14, 70	1,47			
Commitment to zero risk	Post-test	14,82	1,31	0.220	0.803	Sphericity assumed
	6 months	14,64	1,25			
	48 months	14,82	1,42			
Transmission of feelings	Post-test	10,40	1,54	2.113	0.140	Greenhouse-Geisser
	6 months	9,73	1,82			
	48 months	10,42	1,79			
Conviction (belief in preventability)	Post-test	25,82	1,96	6.797	0.002**	Sphericity assumed
	6 months	25,42	1,70			
	48 months	24,24	2,15			
Teaching speed control	Post-test	11,52	0,71	1.140	0.325	Sphericity assumed
	6 months	11,18	0,98			
	48 months	11,36	0,99			

Note. $p < 0.05$ (*); $p < 0.01$ (**).

relatively high levels, the absence of significant variation may reflect a degree of attitudinal stability or, alternatively, the need for longer or more intensive interventions to effect measurable change. This outcome underscores the importance of integrating deeper experiential methodologies and sustained reinforcement strategies, particularly in areas involving ethical convictions, entrenched habits, or culturally normalised beliefs that are more resistant to transformation.

In summary, the data presented in Table 3 support the partial efficacy of the training programme. The intervention succeeded in transforming several core attitudinal dimensions among trainee educators while also revealing areas where further pedagogical innovation is necessary to foster a more comprehensive and enduring commitment to safe mobility through professional teaching practice.

3.2. Longitudinal analysis of the effects of the attitude change model on teaching predisposition and pedagogical practices over a 48-month period

The results indicated that predisposition towards teaching safe driving remained stable throughout the 48-month follow-up period ($M <$ sub $>$ post$<$/sub$>$ = 184.36; $M <$ sub $>$ 6 months$<$/sub$>$ = 180.18; $M <$ sub $>$ 48 months$<$/sub$>$ = 184.24). As shown in Table 4, no statistically significant differences were found across the three time points, $F = 1.425$, $p = 0.248$, suggesting that participants maintained high levels of predisposition over time.

The profile plot (Fig. 2) displayed a temporary decline in predisposition at six months, followed by a return to post-test levels at 48 months. This trend may indicate the consolidation of attitudinal internalisation after an initial period of professional adaptation.

Similarly, teaching strategies targeting risk factors showed no significant changes over time ($Q = 1.333$, $p = 0.513$). Most educators reported having adapted their pedagogical approach by the end of the course, and this change was maintained over 48 months (see Table 5).

The factor-level analysis revealed the following trends:

Practice of safe driving

No significant differences were found ($F = 1.587$, $p = 0.213$; $M <$ sub $>$ post$<$/sub$>$ = 34.67; $M <$ sub $>$ 6 m$<$/sub$>$ = 33.55; $M <$ sub $>$ 48 m$<$/sub$>$ = 35.15). Fig. 3 shows a temporary drop at six months followed by a rise beyond post-test levels, suggesting internalisation of safe driving practices during real-world implementation.

Motivation for teaching safe driving

Scores remained stable ($F = 0.373$, $p = 0.690$; $M <$ sub $>$ post$<$/sub$>$ = 31.21; $M <$ sub $>$ 6 m$<$/sub$>$ = 30.88; $M <$ sub $>$ 48 m$<$/sub$>$ = 31.12). Fig. 4 reflects a small decrease at six months, followed by recovery, indicating long-term professional integration of motivation.

Risk anticipation

Significant variation was observed ($F = 3.56$, $p = 0.034$; $M <$ sub $>$ post$<$/sub$>$ = 24.15; $M <$ sub $>$ 6 m$<$/sub$>$ = 22.97; $M <$ sub $>$ 48 m$<$/sub$>$ = 24.52). Bonferroni adjustment showed a trend between six and 48 months ($p = 0.08$). Fig. 5 illustrates a drop followed by improvement beyond post-test levels, suggesting strengthened anticipatory competence.

Social risk control

No significant differences emerged ($F = 2.83$, $p = 0.067$; $M <$ sub $>$ post$<$/sub$>$ = 17.03; $M <$ sub $>$ 6 m$<$/sub$>$ = 16.70; $M <$ sub $>$ 48 m$<$/sub$>$ = 17.91). A slight decline was followed by improvement, as shown in Fig. 6, suggesting maturation in the educators' capacity to manage social risk.

Alcohol and driving

No significant differences were detected ($F = 1.58$, $p = 0.220$; $M <$ sub $>$ post$<$/sub$>$ = 14.76; $M <$ sub $>$ 6 m$<$/sub$>$ = 15.12; M

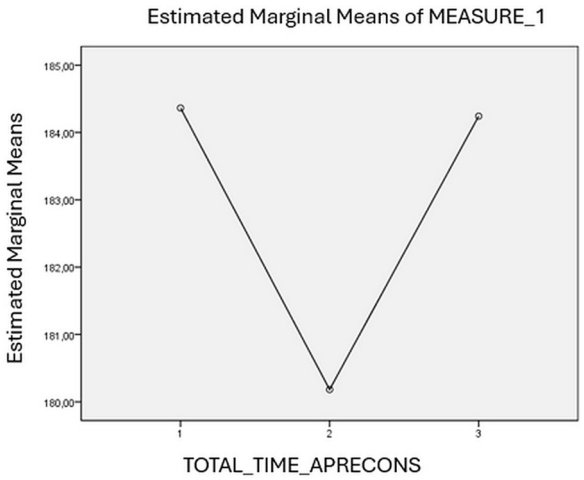

Fig. 2. Comparison of mean APRECONS scores at three time points, showing a statistically significant increase in predisposition following the course and its preservation over time.

Table 5
Changes in teaching strategies attributed to the training – Cochran's Q Test.

Variable	Time Point	Response	*n*	%	Cochran's Q	*p*
Changes in teaching strategies	Post-test	Si	32	97	1.333	0.513
		No	1	3		
	6 meses	Si	39	86.7		
		No	6	13.3		
	48 meses	Si	44	91.7		
		No	4	8.3		

Note. $p > 0.05$ indicates no statistically significant change over time.

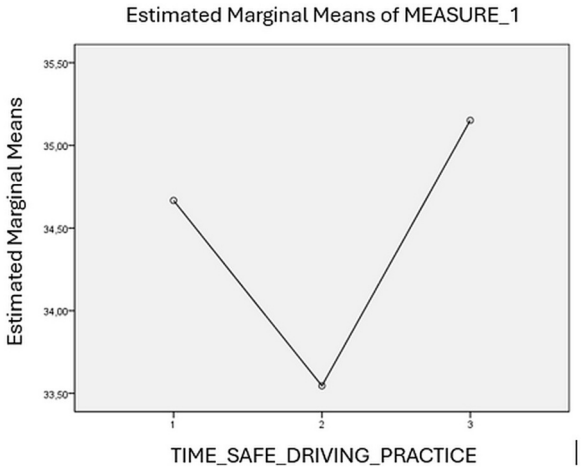

Fig. 3. Longitudinal evolution of road safety educators' predisposition to teach safe driving, based on APRECONS scores at three time points: post-test, 6-month follow-up, and 48-month follow-up. The data show a temporary decrease at six months followed by a recovery, indicating sustained internalisation of attitudinal change over time.

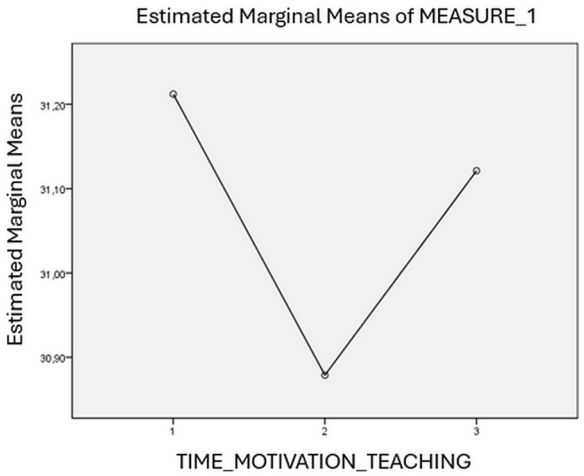

Fig. 4. Longitudinal evolution of educators' motivation to teach safe driving, as measured by APRECONS. The results indicate relative stability across the three time points, with a slight dip at six months followed by a return to initial post-training levels, suggesting moderate consolidation of professional motivation.

< sub > 48 m</sub> = 14.70). Fig. 7 reveals a temporary increase in awareness followed by a small decline, highlighting the need for reinforcement in this area.

Commitment to zero risk

Scores remained stable ($F = 0.220$, $p = 0.803$; $M <$ sub > post</sub> = 14.82; $M <$ sub > 6 m</sub> = 14.64; $M <$ sub > 48 m</sub> = 14.82). Fig. 8 indicates consistent commitment with only minor fluctuations.

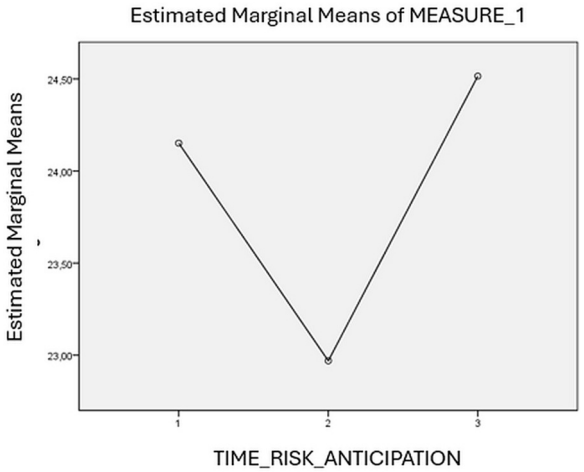

Fig. 5. Longitudinal changes in educators' risk anticipation competences as measured by APRECONS. The figure shows a decline at the six-month follow-up and a significant recovery by 48 months, suggesting deeper internalisation of safe driving anticipatory behaviours over time.

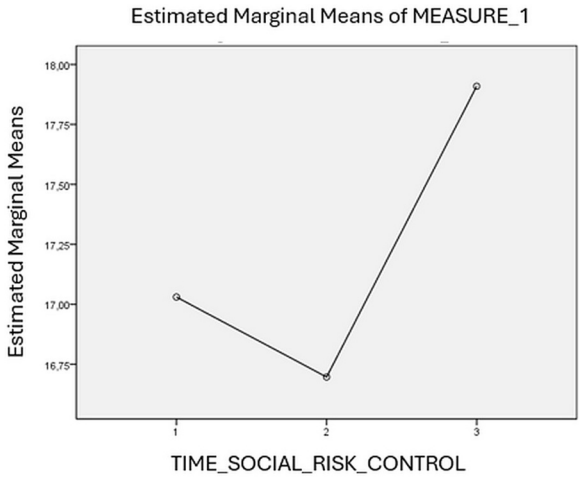

Fig. 6. Changes over time in educators' ability to manage social risk within the vehicle, as assessed by APRECONS. While a slight decline was observed at the six-month follow-up, scores improved notably by 48 months, suggesting growing internalisation of social responsibility in driving contexts.

Transmission of positive emotions towards road safety

No significant change was observed ($F = 2.113$, $p = 0.140$; $M <$ sub $>$ post$<$/sub$> = 10.40$; $M <$ sub > 6 m$<$/sub$> = 9.73$; $M <$ sub > 48 m$<$/sub$> = 10.42$). As shown in Fig. 9, emotional transmission dipped slightly at six months but fully recovered by 48 months, suggesting progressive emotional integration.

Pedagogical conviction

A significant decline was detected ($F = 6.797$, $p = 0.002$; $M <$ sub $>$ post$<$/sub$> = 25.82$; $M <$ sub > 6 m$<$/sub$> = 25.42$; $M <$ sub > 48 m$<$/sub$> = 24.24$). Bonferroni adjustment showed a significant drop between post-test and 48 months ($p = 0.02$) and a trend between six and 48 months ($p = 0.057$). Fig. 10 illustrates this gradual erosion, indicating potential attrition in the absence of pedagogical reinforcement.

Teaching speed control

No statistically significant differences emerged ($F = 1.14$, $p = 0.325$; $M <$ sub $>$ post$<$/sub$> = 11.52$; $M <$ sub > 6 m$<$/sub$> = 11.18$; $M <$ sub > 48 m$<$/sub$> = 11.36$). As depicted in Fig. 11, motivation declined at six months and partially recovered by 48 months, reflecting relative stability.

3.3. Influence of the attitude change model on the evolution of beliefs regarding risk factors in driving

No statistically significant differences were observed in participants' beliefs about risk factors across the three measurement points,

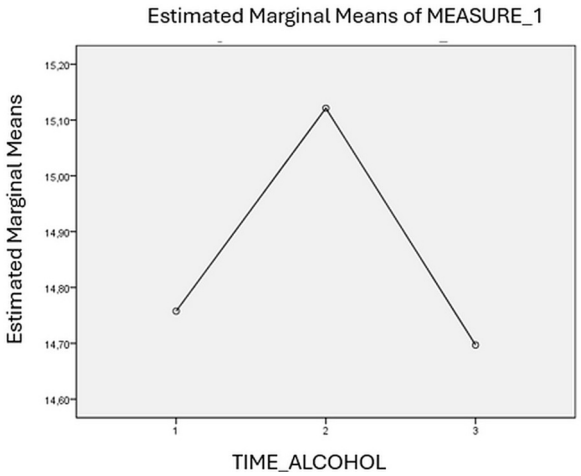

Fig. 7. Evolution of attitudes toward alcohol and driving, as measured by APRECONS. A temporary increase in awareness was observed at the six-month follow-up, followed by a slight decline at 48 months, suggesting the need for reinforcement to maintain long-term behavioural rejection of alcohol-related risk.

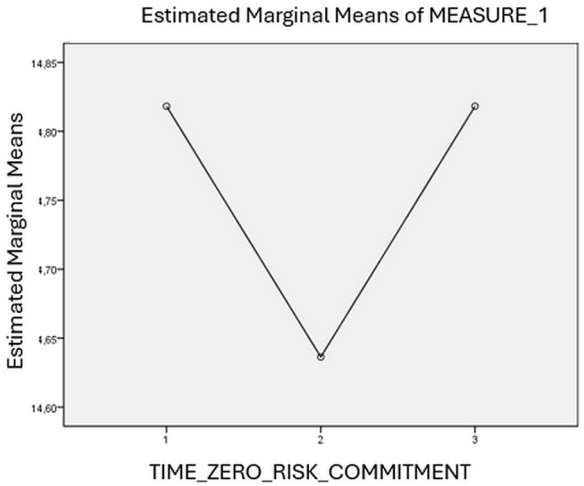

Fig. 8. Evolution of educators' commitment to zero-risk driving practices over time. The figure shows a slight decrease at the six-month follow-up with full recovery by 48 months, indicating sustained professional commitment to risk elimination in driving education.

$Q = 3.80$, $p = 0.150$. This suggests that the course promoted a stable and sustainable conceptual framework regarding road safety beliefs among the instructors. The absence of significant variation supports the notion that the model fostered a coherent and enduring change in perception that persisted throughout the 48-month period (see Table 6).

3.4. Identification of changes in safe driving behaviours and their persistence over time

No statistically significant differences were observed across the three time points in the safe driving behaviours reported by road safety educators, $Q = 2.00$, $p = 0.368$. This suggests that the influence of the training on participants' personal driving practices remained stable over time. The results indicate that behavioural changes achieved by the end of the course were maintained consistently throughout the 48-month follow-up period (see Table 7).

3.5. Analysis of the model's impact on the consolidation of teachers' conviction regarding the usefulness of the attitude change approach

No statistically significant differences were found across the three time points in participants' conviction regarding the usefulness of the attitude change approach, $Q = 2.00$, $p = 0.368$. Reported conviction levels remained consistently high, ranging from 97.8 % to 100 %, suggesting a strong and stable belief in the value of attitudinal training for both instructor education and learner driver preparation. These results indicate that participants' pedagogical conviction was effectively consolidated and sustained over the 48-

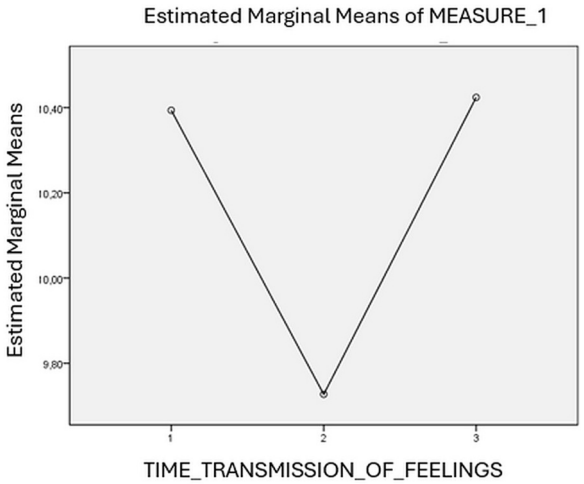

Fig. 9. Longitudinal evolution of educators' ability to transmit positive emotions toward road safety. A temporary decrease was observed at six months, followed by a full recovery at 48 months, suggesting progressive integration of emotional engagement in professional teaching practices.

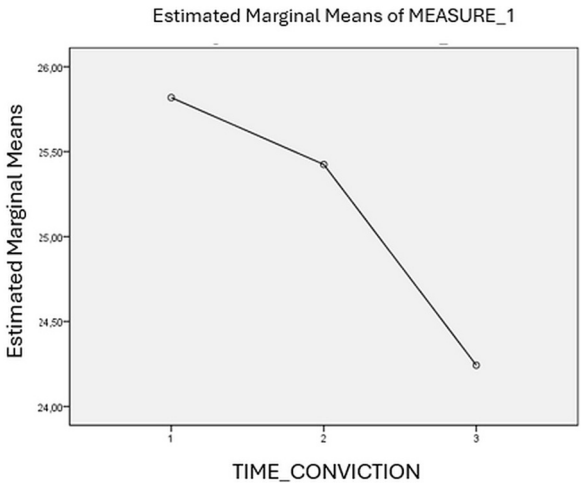

Fig. 10. Decline in educators' pedagogical conviction regarding the attitude change model over time. While conviction remained relatively stable six months after the course, a statistically significant decrease was observed at the 48-month follow-up, suggesting potential erosion of commitment in the absence of reinforcement.

month follow-up period (see Table 8).

3.6. Evolution of commitments undertaken by educators after the training and their reinforcement over time

The analysis of educators' commitments over time revealed a significant decline in the proportion of participants who were able to recall their commitment. As shown in Table 9, recall decreased from 86.7 % at six months to 60.4 % at 48 months, a difference that was statistically significant ($p = 0.017$). This suggests a weakening in memory or salience of the original commitment over time, despite its initial strength.

In contrast, the proportion of participants who reported still applying their commitment remained stable throughout the observation period. As shown in Table 10, over 80 % of educators consistently reported applying their commitment even after 48 months, with no statistically significant change over time ($p = 0.45$). These results indicate a high degree of behavioural consistency and continued professional alignment with the values internalised during training.

Statistically significant changes were observed in the distribution of favourable commitments across the three measurement points. The proportion of favourable commitments decreased by 13.3 % at six months but rose again by 6.2 % at the 48-month follow-up. This variation was statistically significant ($Q = 7.00$, $p = 0.030$), as detailed in Table 11. These findings suggest that, despite a temporary decline, educators recovered and reaffirmed their commitment orientation over time.

Most notably, the proportion of participants who reported having improved upon their original commitment increased

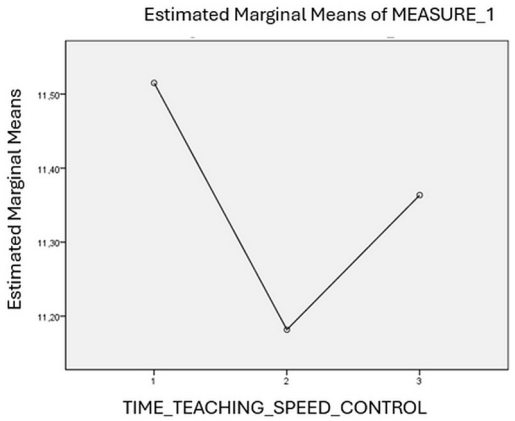

Fig. 11. Changes in educators' predisposition to teach speed control over time. A slight decline was observed at six months, followed by a moderate increase by 48 months, indicating relative stability with partial recovery of pedagogical focus on speed regulation.

Table 6
Changes in beliefs attributed to the training – Cochran's Q Test.

Variable	Time Point	Response	*n*	%	Cochran's Q	*p*
Changes in beliefs	Post-test	Yes	29	87.9	3.80	0.150
		No	4	12.1		
	6 months	Yes	43	95.6		
		No	2	4.4		
	48 months	Yes	38	80.9		
		No	9	19.1		

Note. $p > 0.05$ indicates no statistically significant change across time points.

Table 7
Changes in driving behaviour attributed to the training – Cochran's Q test.

Variable	Time Point	Respuesta	*n*	%	Q de Cochran	*p*
Changes in driving behaviour	Post-test	Yes	32	97	2.00	0.368
		No	1	3		
	6 months	Yes	40	90.9		
		No	4	9.1		
	48 months	Yes	46	95.8		
		No	2	4.2		

Note. $p > 0.05$ indicates no statistically significant change across time points.

Table 8
Changes in conviction regarding the usefulness of training based on attitude change – Cochran's Q Test.

Variable	Time Point	Response	*n*	%	Cochran's Q	*p*
Conviction in the usefulness of attitude-based training for road safety educators	Post-test	Si	33	100	2.00	0.368
		No	0	0		
	6 months	Si	44	97.8		
		No	1	2.2		
	48 months	Si	48	100		
		No	0	0		
Conviction in the usefulness of attitude-based training for learner drivers	Post-test	Si	33	100	Not computable: all responses	
		No	0	0	were identical	
	6 months	Si	45	100		
		No	0	0		
	48 months	Si	48	100		
		No	0	0		

Note. For the second variable, Cochran's Q could not be computed due to uniform responses at all time points.

Table 9
Analysis of Commitment Recall Over Time – McNemar's Test.

Variable	Yes		No		*p*
	n	%	*n*	%	
Recall of commitment at 6 months	39	86.7	6	13.3	0.017*
Recall of commitment at 48 months	29	60.4	19	39.6	

Note. $p < 0.05$ indicates statistically significant reduction in recall over time.

Table 10
Analysis of the applicability of commitments over time – McNemar's test.

Variable	Si		No		*p*
	n	%	*n*	%	
Application of the commitment at 6 months	40	88.9	5	11.1	0.45
Application of the commitment at 48 months	42	95.5	2	4.5	

Note. Specific frequencies not provided; interpretation based on > 80 % adherence at 48 months. $p > 0.05$ indicates no statistically significant change.

Table 11
Analysis of the validity of commitments across three time points – Cochran's Q test.

Variable	Time Point	Commitment Assessment	*n*	%	Cochran's Q	*p*
Commitment	Post-test	Favourable	23	100.0	7.00	0.030*
		Unfavourable	0	0.0		
	6 months	Favourable	18	86.7		
		Unfavourable	5	13.3		
	48 months	Favourable	22	92.9		
		Unfavourable	1	7.1		

Note. $p < 0.05$ indicates statistically significant change in commitment evaluations over time.

Table 12
Analysis of commitment improvement – McNemar's test.

Variable	Yes		No		*p*
	n	%	n	%	
Improved commitment at 6 months	33	76.7	10	23.3	0.039*
Improved commitment at 48 months	43	91.5	4	8.5	

Note. $p < 0.05$ indicates a statistically significant increase in the proportion of educators who reported having enhanced their commitment over time.

substantially between the two follow-up points. As shown in Table 12, this percentage rose from 76.7 % at six months to 91.5 % at 48 months, a statistically significant difference ($p = 0.039$). This outcome suggests a progressive deepening of ethical engagement, with educators not only maintaining but actively enhancing their initial commitment to safe mobility over time.

4. Discussion

4.1. Interpretation of results

The findings of this study provide robust empirical evidence for the long-term effectiveness of an attitudinal change model in road safety instructor training. The sustained improvements observed across most of the APRECONS dimensions suggest that the internalisation of safe driving attitudes, values, and pedagogical predispositions was not merely transient but consolidated over time, echoing previous calls in the literature for interventions that go beyond technical skill acquisition and foster deep, value-based learning (Bates et al., 2019; Tingvall & Haworth, 1999; Arnau-Sabatés et al., 2013). As a reminder, the APRECONS assessed nine dimensions of teaching predisposition: practice of safe driving, risk anticipation, motivation for teaching, social risk control, rejection of alcohol and driving, commitment to zero risk, transmission of emotional values, pedagogical conviction, and teaching speed control. In parallel, the CPFV focused on beliefs, self-reported behaviours, and professional conviction.

Particularly notable are the results related to risk anticipation, the transmission of affective road safety values, and the commitment to zero-risk behaviour. These dimensions align with the higher-order psychological and ethical competencies outlined in Levels 3 and 4 of the Goals for Driver Education (GDE) matrix, which several authors have highlighted as critical yet underrepresented in traditional training programmes (Hatakka et al., 2017; Peräaho et al., 2003; European Commission, 2019). The findings suggest that these higher-order competencies are not only teachable but also retainable over time, thereby supporting the theoretical premise of the attitude

change model (Montané-Capdevila et al., 2007; Jariot-Garcia & Montané-Capdevila, 2014).

The temporary decline observed at the six-month follow-up, followed by recovery or improvement at 48 months, likely reflects a process of professional adaptation and emotional reconfiguration. This trend supports previous research suggesting that authentic attitudinal change requires sustained reflection and experience in real-world contexts (Arnau-Sabatés & Montané-Capdevila, 2010a; Ram & Chand, 2016). It also reinforces the idea that transformation occurs gradually, often deepening after initial fluctuations in motivation or conviction.

Furthermore, the enduring stability of self-reported safe driving behaviours and road safety beliefs suggests a strong alignment between participants' professional roles and their personal conduct. This coherence is consistent with findings in teacher education literature indicating that congruence between personal and professional values enhances instructional credibility and long-term behavioural modelling (Arnau-Sabatés et al., 2012; Barboza-Palomino et al., 2017).

Lastly, the high retention of ethical and pedagogical commitments, despite some decline in recall, confirms the model's capacity to support sustained professional integration. This aligns with the broader notion that effective road safety education requires instructors to move from normative compliance toward value-driven engagement—a shift that, according to recent frameworks, is essential for achieving transformative educational outcomes in mobility contexts (Jawi et al., 2017; World Health Organization, 2021).

4.2. Long-term professional implications

The long-term stability of predisposition, conviction, and ethical commitment among participants supports the transformative potential of the attitude change model to reshape the professional identity of road safety educators. These results indicate that the intervention not only produces short-term pedagogical change but also fosters a sustained internalisation of road safety values, suggesting a profound integration of ethical principles into professional practice (Arnau-Sabatés et al., 2013; Jariot-Garcia & Montané-Capdevila, 2009, 2014).

This sustained change redefines the instructor's role from a transmitter of technical knowledge to a reflective agent capable of guiding attitudinal transformation in learners. Such a role is essential for realigning instructor training with the higher levels of the GDE matrix, particularly those associated with self-regulation, values, and life goals (Hatakka et al., 2017; Peräaho et al., 2003). The attitudinal dimensions most enhanced—such as risk anticipation and affective engagement—are directly connected to these upper levels, reinforcing the model's strategic alignment with theoretical frameworks that prioritise motivation and value-based instruction over normative rule enforcement (Tingvall & Haworth, 1999; Katila et al., 1996).

Furthermore, the coherence between participants' pedagogical convictions and their personal driving behaviours lends credibility to their professional role as ethical models. This alignment strengthens instructional authenticity and increases the likelihood that learners will internalise safe driving behaviours through identification and attitudinal resonance (Arnau-Sabatés & Montané-Capdevila, 2010b; Callealta et al., 2020). As research has noted, the educator's capacity to embody the values they teach is crucial for the long-term success of road safety interventions (Rodwell et al., 2018; Jawi et al., 2017).

The results also support recent claims that mobility education should be understood as a lifelong, multidimensional process requiring instructors who are both ethically grounded and pedagogically innovative (European Parliament, 2021; United Nations Road Safety, 2020). The model's impact on sustained professional commitment and reflective teaching supports a pedagogical paradigm shift—moving away from episodic training and toward an integrative approach that cultivates ongoing self-regulation and ethical awareness in both instructors and learners (Montané-Capdevila et al., 2007; Jariot-Garcia et al., 2024).

4.3. Policy and training recommendations

The results of this study have direct implications for the design, accreditation, and evaluation of road safety instructor training programmes. First, the demonstrated effectiveness of the attitude change model supports its integration as a core pedagogical framework in official certification curricula for driving instructors. Given its capacity to produce long-lasting attitudinal transformations—particularly in relation to risk anticipation, emotional engagement, and professional conviction—the model should be institutionalised as a foundational component of mobility education policy (Arnau-Sabatés et al., 2013; Montané-Capdevila et al., 2007).

Second, the model's alignment with the upper levels of the Goals for Driver Education (GDE) matrix underscores its suitability for addressing dimensions typically neglected by conventional training schemes. Policymakers and training institutions should prioritise these higher-order competencies—such as ethical reasoning, self-regulation, and value internalisation—within national road safety strategies (Hatakka et al., 2017; European Commission, 2019). The implementation of pedagogical approaches that promote reflection and emotional engagement can strengthen not only the technical quality but also the ethical coherence of driver education systems (Tingvall & Haworth, 1999; Rodwell et al., 2018).

Third, the study reveals the strategic relevance of viewing road safety instructors not merely as procedural technicians but as educational agents of behavioural change. Public authorities responsible for mobility education, such as the Servei Català de Trànsit, should reinforce this conceptualisation through specific guidelines, evaluation rubrics, and professional development requirements that reward value-driven teaching approaches. This shift in the instructor's role is especially pertinent in contexts seeking to reduce accident rates through cultural transformation rather than enforcement alone (Jariot-Garcia & Rodríguez-Parrón, 2007; Arnau-Sabatés & Montané-Capdevila, 2010a).

Fourth, the results highlight the need for sustained support mechanisms beyond initial training. Although the study demonstrates the model's long-term impact, the temporary decline observed at six months suggests that periodic reinforcement strategies—such as

follow-up workshops, reflective supervision, or peer mentoring—may enhance the consolidation of attitudinal gains. These initiatives could form part of broader lifelong learning pathways for driving instructors, consistent with recommendations from international road safety bodies (World Health Organization, 2021; United Nations Road Safety, 2020).

In addition, regulatory frameworks should require the systematic inclusion of evaluative processes that assess not only technical competence but also attitudinal development. Assessment protocols must incorporate validated tools—such as those used in this study—that capture complex constructs like ethical commitment, belief revision, and pedagogical congruence. Such measures would ensure that training programmes are held accountable for fostering meaningful, sustained change in instructors' teaching and driving practices.

4.4. Limitations and directions for future research

While the present study provides meaningful insights into the long-term impact of attitudinal training for road safety educators, certain methodological limitations must be acknowledged. First, the absence of a control group limits the ability to fully isolate the effects of the intervention. This decision, however, was ethically grounded in the nature of the programme as a publicly accredited training course open to all eligible candidates, and was methodologically addressed through the use of a quasi-experimental longitudinal design with repeated measures, a strategy widely accepted for studies in real-world educational contexts (Creswell & Creswell, 2022; Tejada Betancourt, 2023).

Second, the study relied on self-reported data, which, although collected through validated and reliable instruments (Montané-Capdevila et al., 2021), may be susceptible to social desirability bias or memory decay—particularly in long-term follow-up phases. While the 48-month response rate reached 100 %, enhancing the robustness of the longitudinal component, future studies would benefit from incorporating observational data or triangulating with learner feedback to enrich the understanding of behavioural consistency over time.

Third, the sample size—although appropriate for a census of the full training cohort—limits the statistical generalisability of findings. Nevertheless, the homogeneity and specificity of the population, combined with the complete recovery of the sample at all phases, lend internal consistency and contextual depth to the results. Further research across broader and more diverse populations is encouraged to assess the model's scalability and adaptability in different regional or national contexts.

Future studies should also explore the long-term influence of attitudinal training on learners' actual driving behaviours and crash rates, thereby connecting the instructor-level impact to system-wide road safety outcomes. Additionally, the integration of qualitative methodologies—such as narrative interviews or ethnographic approaches—could provide deeper insight into the reflective and emotional processes involved in attitudinal consolidation, as already outlined in the broader mixed-methods design of this research project.

An additional line of inquiry involves exploring the role of periodic reinforcement mechanisms—such as follow-up training, mentoring, or communities of practice—in maintaining long-term attitudinal change. Investigating how digital platforms or blended learning strategies can support reflective practice and ethical engagement over time may prove especially valuable in extending the reach and sustainability of the model.

5. Conclusions

This study provides compelling evidence of the long-term effectiveness of an attitudinal change model applied to the training of road safety educators. Through a quasi-experimental longitudinal design spanning four years, the research demonstrates that pedagogical predispositions, ethical commitments, and core attitudinal dimensions can be meaningfully transformed and sustained over time. These findings respond directly to the need for instructor training approaches that go beyond technical instruction and engage learners at cognitive, emotional, and ethical levels.

The model's alignment with the upper tiers of the Goals for Driver Education (GDE) matrix reinforces its theoretical and pedagogical relevance. By promoting risk anticipation, reflective teaching practices, and emotional engagement, the intervention supports a paradigm shift in road safety education—one that positions the instructor not merely as a transmitter of knowledge, but as a value-driven role model.

The longitudinal stability observed across most indicators—despite natural fluctuations—underscores the model's capacity to foster durable internalisation processes. Furthermore, the alignment between participants' teaching practices and personal driving behaviours highlights the potential for cultivating instructional authenticity and coherence, key components in influencing novice drivers' attitudes and behaviours.

In a field where training outcomes are often evaluated in the short term, this study contributes robust empirical data on the persistence of attitudinal gains over extended periods. It also sets a precedent for embedding ethically grounded, value-based frameworks into official certification programmes. By demonstrating the feasibility and impact of such models, the research offers a valuable foundation for rethinking policy, programme design, and professional development in the context of road safety education.

Data statement

The data that support the findings of this study are not publicly available due to restrictions related to participant confidentiality and institutional policy. However, anonymised data may be made available from the corresponding author upon reasonable request.

Use of AI Tools During the preparation of this manuscript, the authors used ChatGPT (OpenAI) to improve linguistic clarity and expression. After using this tool, the authors reviewed and edited the content as necessary, taking full responsibility for the integrity and accuracy of the work.

CRediT authorship contribution statement

Jose Tello-Sánchez: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft, Writing – review & editing. **Mercè Jariot-García:** Supervision, Methodology, Formal analysis, Validation, Writing – review & editing. **Montserrat Rodríguez-Parrón:** Methodology, Supervision.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

The authors do not have permission to share data.

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Further reading

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