

TITLE: Digital Transformation and Standardization of a Road Safety Leadership Training Program: Preliminary Findings.

INTRODUCTION

Road traffic injuries remain a leading cause of death globally, with a disproportionate burden in low- and middle-income countries. In Africa, mortality rates are among the highest worldwide. The Africa Status Report on Road Safety 2025 estimates an average of 19.6 deaths per 100,000 population, with the continent accounting for 24% of global road traffic fatalities despite owning only 4% of the world's vehicles (Chomi et al. 2025). While most regions have seen declining trends, road traffic deaths in Africa increased by 17% between 2011 and 2021 (World Health Organization 2023). These figures highlight that, despite ongoing efforts, progress remains insufficient, and that more scalable, sustained, and systemic action is urgently needed.

The United Nations Decade of Action for Road Safety 2021–2030 establishes a target of reducing road traffic deaths and injuries by at least 50% and identifies the Safe System approach as the guiding framework for achieving this objective (United Nations 2020; World Health Organization 2021). Meeting this target depends on the availability of technical and institutional capacity to design, implement, and evaluate road safety interventions. In this context, strengthening the skills, leadership, and technical competence of road safety professionals is widely recognized as a prerequisite for effective road safety management and long-term impact (World Health Organization 2021).

However, such capacity remains limited among professionals and institutions at the local and even regional levels, particularly in contexts where road safety is not fully integrated into academic curricula or professional development pathways. To respond to this gap, the Africa Transport Policy Program (SSATP) launched the Leaders in Road Safety Management Training Program (LRSMTTP) in 2024 (World Bank Group 2024). The curriculum consists of approximately 25 hours of in-class instruction, and it has been delivered three times in a one-week, in-person intensive teaching format with positive evaluations.

Nevertheless, the scale of Africa's road safety challenge demands solutions that go beyond traditional, resource-intensive training models. Education systems worldwide are undergoing rapid transformation driven by digital technologies, online platforms, and artificial intelligence (AI). These developments are shifting learning away from one-size-fits-all instruction toward more flexible, learner-centered, and skills-oriented models (Bates 2022). While challenges such as limited connectivity and digital literacy persist, evidence from the region shows that blended, mobile, and low-bandwidth learning solutions can be effective when adapted to local conditions. Moreover, research shows that well-designed online and blended education can match or outperform traditional face-to-face instruction (Nguyen 2015; Arkorful and Abaidoo 2015; Tamim et al. 2011; Bernard et al. 2004; Means et al. 2010). Recent evidence also highlights the importance of video-based content in influencing learner engagement and performance in online environments (Lackmann et al. 2021).

Against this background, the objective of this work is to present the digital transformation and standardization of the LRSMTTP program into an AI-based, freely accessible online resource that can function both as a stand-alone training program and as modules or lectures integrated into graduate education across universities in Africa and beyond. This transformation aims to strengthen long-term capacity development and expose future professionals to foundational frameworks such as the Safe System approach. Given the early stage of implementation, this paper focuses on describing the transformation process, introducing the new instructional format, and discussing the methodological considerations, challenges, and opportunities associated with the use of AI in this context. As such, the paper is positioned as an implementation-focused contribution rather than a traditional hypothesis-driven research study based on the analysis of empirical data.

METHODS

The existing training program, originally developed in English, was transformed into a series of stand-alone teaching capsules using a structured protocol designed by the research team. Each capsule includes clearly defined learning objectives, systematically organized instructional content, and assessment components.

In addition, capsules were mapped against competency frameworks across both health- and non-health-oriented university curricula. Each capsule is designed to require approximately 50 minutes of student engagement, although faculty members may use selected components within their existing courses. Capsules can also be combined to form modules or to lead into the original full course.

All capsules are registered under a Creative Commons license (CC BY-NC-SA) and the Spanish Intellectual Property Registry and are hosted on an open-access platform. Users, including both students and faculty, can rate their usefulness and provide feedback.

Artificial intelligence was used throughout the transformation process, including, but not limited to, the creation of faculty avatars that can be adapted to different linguistic and cultural contexts.

Capsule review followed peer-review protocols, ensuring alignment with Safe System principles and content quality.

A standardized development framework was established to ensure consistency, quality, and coherence across all materials. Capsule development was led by university faculty, with participation from African faculty members to enhance contextual relevance, local ownership, and long-term sustainability.

A combination of AI-assisted tools was used for script generation, content adaptation, and audiovisual production (OpenAI 2025; Gamma Technologies Inc. 2025; HeyGen Inc. 2024; Freepik Company 2024; Adobe Inc. 2024). AI was also used to identify competencies in graduate studies where these teachings would be useful, as well as to support quality control in the capsule production process. Universidad Pontificia Comillas and the World Bank's SSATP host the servers where the capsules are stored and evaluated. The African Road Safety Observatory also collaborates in the project.

All materials and reviews were supervised by expert faculty; however, the intended use of AI corresponded to level 4 (full AI) (Perkins et al. 2024).

RESULTS

The LRSMTP curriculum has been decomposed into 48 standardized learning units (“learning capsules”), delivered as stand-alone units that are publicly available together with their corresponding supporting materials. Table 1 presents a sample capsule from each of the Safe System pillars. Each capsule features avatar-led instruction and may include activities and short videos. Capsules are available in English, French, Portuguese, and Spanish, with the capacity to be adapted to additional linguistic and regional contexts. The use of concise video formats, combined with avatar-based delivery, is intended to enhance learner engagement and support more effective knowledge acquisition.

	Capsule title	Topics covered
Capsule 1	Understanding the Safe System Approach in African Contexts	Safe System philosophy Shared responsibility Human vulnerability Systemic risk management
Capsule 6	Road Safety Legislation and Regulatory Framework	International legal standards Legislative harmonization Enforcement frameworks Regulatory modernization
Capsule 19	Motorcycle and Moto-Taxi Safety	Motorcycle risk factors Helmet systems Commercial motorcycle transport Regulatory approaches
Capsule 26	Active and Passive Vehicle Safety Technologies	Seatbelts Airbags ESC ABS Crashworthiness
Capsule 32	Driver Training and Licensing Systems	Licensing models Competency-based training Hazard perception
Capsule 38	Intersectoral Coordination in Post-Crash	Response Health-transport coordination Incident management Information sharing

Table 1. Selected capsules and content

Collectively, the learning capsules address core domains of road safety management, including risk factors, system design, and intervention strategies across pre-crash, crash, and post-crash phases. Individually, they enable the integration of road safety principles into a wide range of undergraduate, graduate, and postgraduate programs.

Each capsule is accompanied by a teaching guide and a technical guide, both completed by the faculty member responsible for developing the capsule. The teaching guide goes beyond describing content, providing a complete instructional sequence that can be directly used by instructors. It ensures alignment between learning outcomes, content, teaching and learning activities, and assessment tasks, supporting a coherent and structured learning experience. The technical guide defines the specifications required for production and delivery. Development typically

requires a script and, in most cases, supporting slides, with optional integration of videos, readings, and additional teaching activities. All materials must be prepared in advance of the creation of the capsule. These materials can then be translated into multiple languages and adapted to diverse cultural contexts, with each adaptation generating a distinct version of the learning capsule that is appropriately documented. Each version of a learning capsule is registered under Creative Commons licenses.

The initial transformation of a learning capsule required several hours of work, with subsequent linguistic or cultural adaptations requiring additional time. These efforts were higher during the initial stages of development but have decreased over time, to 3-5 hours, with improvements in AI tools and increased standardization of the production process.

In addition to linguistic and cultural adaptations, capsules can be updated as new data or contextual needs arise, requiring only limited additional effort, primarily involving modifications to scripts or slides.

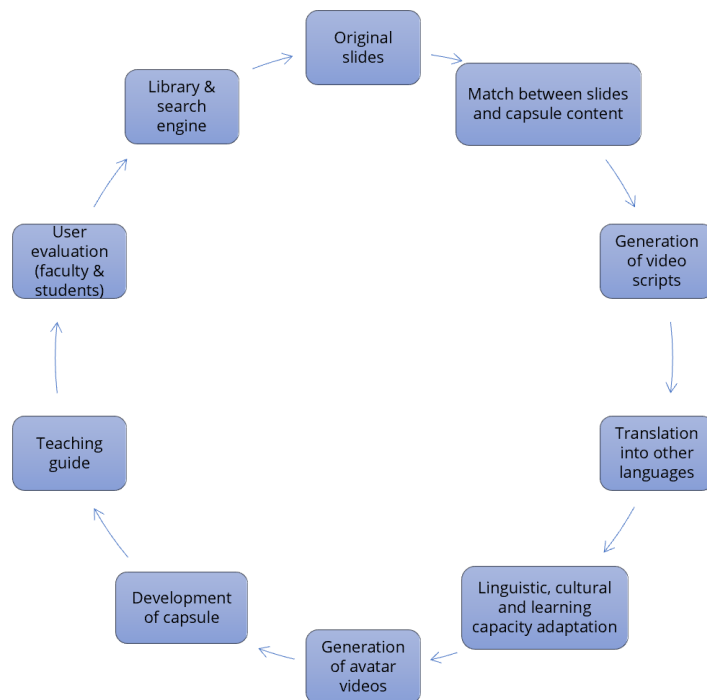


Figure 1. Capsule development flow diagram.

Capsules are designed for repeated use across different instructional settings, as Figure 2 illustrates with a screenshot of a capsule in Portuguese.



Figure 2. Screenshot of a capsule in Portuguese.

These observations support the feasibility of transforming existing materials into “learning capsules”. The program is expected to improve knowledge acquisition in key road safety domains, including system-based approaches and intervention strategies. The modular format is designed to promote engagement and facilitate completion of training components.

Deployment is planned for the 2026-2027 academic year, including implementation through African university networks such as the South–South Academia Cooperation (SSAC) and the Association of Jesuit Colleges and Universities of Africa and Madagascar (AJCU-AM), while remaining open to broader institutional participation. The URL hosting these capsules will be public by October 2026.

Evaluation will follow a mixed-methods approach, combining quantitative assessments of knowledge acquisition with participation metrics and qualitative feedback on usability and relevance.

DISCUSSION

To our knowledge, this represents the first application of AI-based avatar instruction for road safety education across multiple languages within an asynchronous, digital learning environment. The transformation of the training program addresses key limitations of traditional capacity-building approaches, particularly in terms of scalability, accessibility, and sustainability.

Given its implementation focus, this work does not aim to provide outcome-based evaluation at this stage, but rather to document a scalable approach and inform future applications and assessments.

The efficiency gains associated with standardized capsule production and digital delivery represent a significant advantage. Advances in digital content production and open educational resources reduce marginal delivery costs while enabling broader dissemination.

Several challenges emerged, particularly in the conceptualization and structuring of a scalable production process for a large volume of content intended for international use. In addition, aligning content with diverse university competency frameworks proved complex, reflecting the lack of standardized approaches across institutions. Establishing a blinded peer-review process to ensure the quality of capsule content also represented a challenge.

The modular architecture enables flexible use, either as a complete program or as individual units integrated into academic or professional training environments. While adoption and user evaluation remain to be assessed, existing evidence indicates that well-designed online learning is both cost-effective and sustainable, especially in resource-constrained settings (Bates 2022; Rumble 2001; Bartley and Golek 2004; Herman and Banister 2007).

The intervention aligns with the Safe System approach by fostering the development of competencies required to understand and manage risk across system components, including human factors, infrastructure, and policy environments. Integration into academic programs represents a shift from short-term training toward sustained capacity development and contributes to building a workforce capable of addressing complex road safety challenges.

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