Available online at www.sciencedirect.com

ScienceDirect

Transportation Research Procedia 72 (2023) 271–278

Transportation Research Procedia

www.elsevier.com/locate/procedia

Transport Research Arena (TRA) Conference

Training road users for future mixed automated traffic contexts: a practical framework for creating evidence-based education and awareness schemes

Marilee M. Nugent[a]*, Eleni Chalkia[b], Niccolò Baldanzini[a]

[a]*University of Florence, Dept. Of Industrial Engineering, Via di Santa Marta 4, 50121 Firenze, Italy*
[b]*Hellenic Institute of Transport, Center of Research and Technology Hellas, 6th km Charilaou-Thermis, GR- 60361, Thessaloniki, Greece*

Abstract

Training and awareness programs are developed in an H2020 Research & Innovation project on safety of road user groups in future automated traffic. With reducing crashes by reducing human error, increasing penetration of AVs is also expected to bring disruptions requiring public education and awareness on new traffic risks, safety technology and behaviours. We combine practices of Knowledge Translation of research with Constructive Alignment in educational design for a flexible framework meeting best practice requirements: knowledge users engaged to benefit from their expertise and networks; results translated as messages tailored to diverse audiences; learning outcomes and strategies are user-centred, evidence-based, targeting higher cognitive functions; iterative evaluation, updates. The framework is proposed to facilitate and enhance planning for uptake and impact of road safety R&I.

Keywords: Vulnerable road users; road safety education; automated vehicles; road safety innovation; knowledge translation; stakeholder engagement

1. Introduction

The aim of the H2020 research & innovation project SAFE-UP is to contribute to Vision Zero goals by proactively addressing new road safety challenges expected to accompany increasing penetration of connected and automated vehicles (CAVs). To achieve this, different work packages were tasked with creating new tools and safety technologies to address (i) prediction of future safety critical scenarios through simulations using current crash data and enhanced

* Corresponding author Marilee Nugent. Tel.: +39-333-324-7747
E-mail address: marileemargaret.nugent@unifi.it

2352-1465
10.1016/j.trpro.2023.11.404

models of different road user modes, (ii) active restraint systems for vehicle occupants adapted to new seating positions, (iii) enhanced sensors to improve detection of unprotected road users (URUs) in bad weather, integrated with (iv) advanced automated collision avoidance functions, and (v) CITS-enabled timely warnings through connected infrastructure, vehicles and URUs. Additionally, (vi) new methods for impact assessment will demonstrate the expected combined safety benefits of these systems. Nevertheless, it is expected that all road users will increasingly find themselves in unfamiliar traffic interactions due to the evolving mix of automated and conventional driving functions. The safety implications will be particularly important for pedestrians, cyclists and motorcyclists.

Nomenclature

AVs	Automated vehicles	LO	Learning outcome
CAVs	Connected & automated vehicles	MM	Main message
H2020	Horizon 2020	POV	Point of view
KU	Knowledge user	R&I	Research & Innovation
KTPT©	Knowledge Translation Planning Template©	SDGs	Sustainable Development Goals
KT	Knowledge Translation	URU	Unprotected road user

With this in mind, the project's mandate included a work package dedicated to creating updateable training, education and awareness raising (TE&A) schemes for all road users which match the pace of increasing implementation of automated driving functions. The main focus is on safety while walking, cycling or motorcycling in urban contexts. In addition, schemes should address all road users with regard to URU safety, and should consider diversity – such as region, culture, age, gender and IT-experience. This is a daunting task given that such contexts are not yet a pervasive reality, making development and testing of effective, evidence-based approaches problematic. As well, comprehensive tailoring of programs by region, user group and demographic would be beyond the scope of a 3-year project. An in-depth review of shortfalls and gaps in current driver training and roads user safety education or survey of relevant AV literature is beyond the scope of this paper. Focus was instead directed to current initiatives and advocacy in traffic safety and education, especially regarding unprotected and active mobility modes. At the time of drafting the grant proposal, there was no existing EU approach or guide for URU road safety education that could be adapted to respond to new risks related to disruptions from the increasing penetration of CAVs in the traffic mix.

To address these challenges and meet the objectives of enhancing the safety benefits from project outputs through training, education and awareness raising, a flexible, updatable evidence-based framework is proposed, with intended applications beyond project end to facilitate uptake and implementation of ongoing and future road safety R&I. To create the framework, two existing systems were combined, each addressing different phases and levels of detail in the development of TE&A schemes. The first is Knowledge Translation (KT), also known as planning for impact. KT is recognized as a best practice approach, as well as being a requirement of funders in some countries and research domains (e.g. CIHR; Barwick, 2017). KT goes beyond traditional academic (passive) dissemination to identify also non-academic users of research results, engaging them throughout the research project through iterative processes and activities of exchange, synthesis and co-creation, to facilitate translation of evidence into forms that can inform policy and decision making and be applied towards practice and behaviour change.

The second system integrated into the framework is Bigg's theory of Constructive Alignment in educational design (Biggs, 1996; Whetten, 2007). In part it was chosen to answer the needs of ensuring that education for drivers and other road users should better address higher cognitive skills such as hazard anticipation, traffic participation strategies (ETSC, 2019; ACEM & DVR) and social behavioural factors such as mindfulness (Koppel et al. 2019) and shared responsibility (McAndrews, 2013). Bloom's revised taxonomy of educational objectives (Krathwohl, 2002) is applied to ensure that educational or training goals are not focussed solely on lower level learning goals, such as recall and comprehension, but also stimulates learning for higher cognitive functions such as knowledge application, synthesis and creation (Ibid.).

This paper demonstrates how the resulting framework is applied to guide overall work package activities, creation of deliverables, as well as the processes for translating SAFE-UP outputs into TE&A schemes for promoting URU safety in future mixed AV traffic. With 12 months still remaining in the project, it is envisaged to evaluate the application of the framework to create TE&A materials and programs, with a final report to be delivered including updates, lessons learned and assessments of both the process methodology and knowledge products. The framework is also intended for the benefit of researchers to facilitate dissemination, uptake and implementation of future road safety research and innovation towards enhanced impact on road safety in support of Vision Zero.

2. Methods and approach

2.1. Framework structure and key components

Knowledge translation plan. KT was applied as the overall methodology for WP6, implemented with the aid of a tool called the Knowledge Translation Planning Template© (KTPT©) (Barwick, 2008). The KTPT is freely available from SickKids® Learning Institute, Toronto Hospital along with other support materials (e.g. see Barwick, 2017a,b,c). The KTPT lays out the 13 key components of a targeted dissemination plan. Although depicted in a linear sequence, its implementation is non-linear, with ongoing monitoring forwards and backwards allowing for adjustments in response to the unfolding plan and project. This paper addresses only those components relevant to the current discussion. A full treatment of the template and its application in SAFE-UP can be found in Nugent (2022). The translation of project outputs is guided through core components 5 to 10 which follow a logic flow: identification of knowledge users, crafting targeted main messages from results, determining KT goals for sharing, applying KT strategies, evaluating the plan and its outcomes. The first 3 items of the plan describe the processes for engaging stakeholders (also knowledge users) in the research process. Following best practice, knowledge users should be included throughout a project as opposed to waiting until the end to deliver results in a uni-directional flow of information. Instead, their voices and expertise are included to inform how, when, and by whom the results will be used (Barwick, 2017b). Project partners can perform various roles such as interpreting results, identifying unforeseen applications and users, co-creating new knowledge syntheses. Their buy-in and involvement are critical to ensuring good fit, uptake and sustainability of interventions (Ibid.). Effective partner engagement is a social process involving ongoing relationship-building and two-way exchange of knowledge (Heiden, 2020).

Constructive alignment and bloom's revised taxonomy. The Constructive Alignment approach to educational design represents a paradigm shift from the traditional focus on content to learning outcomes (LOs) (Whetten, 2007). Instead of beginning with *what should we teach?* it asks, *what changes in knowledge, capacity, behaviour or values do we wish to see?* By restating content as performance outcomes that describe what the learner should be able to do or understand as a result of the learning, the program designer is forced to think deeply about what kinds of learning experiences could bring about these changes. Bloom's revised Taxonomy of Educational Objectives (Krathwohl, 2002;) is a tool for explicitly defining each desired Learning Outcome along two dimensions: *type of knowledge*, using nouns, and *level of cognitive processing*, using active verbs. This coding of an LO informs the design and selection of appropriate teaching and learning Activities (TLA) and assessment methods, while facilitating systematic alignment among these three key course design elements. Bloom's Taxonomy is also used to assess how well educational objectives are distributed across the levels of the cognitive dimension (Krathwohl, 2002) to ensure there are no gaps. More details on applying constructive alignment towards SAFE-UP objectives are provided in Nugent (2021).

2.2. Data used in applying the framework

In applying the framework, different types of data were gathered to address separate aspects of creating effective TE&A schemes. Safety knowledge content came from the project research activities as well as relevant supporting references. As the goal was to develop and test a practical flexible framework for developing TE&A schemes, systematic reviews were avoided in favour of an online search of relevant organizations, initiatives, news and research themes. Specific focus of searches was on URUs in the context of current road danger, urban mobility planning and expectations around the evolving implementation of CAVs and CITS. The online search combined with suggestions from project internal partners and advisory board members resulted in a priority list of stakeholders representing a cross-section of the road safety ecosystem who were invited to participate in knowledge exchange and collaboration activities in an ad hoc Safety Partner Network. The organizations engaged included International Federation of Pedestrians (IFP), European Cyclists' Federation (ECF), Institute for two-wheeled safety (IFZ), Federation of

European Motorcyclists Associations (FEMA), European Driving Schools Association (EFA), POLIS - Cities network on transport innovation, ERTICO-ITS public-private partnerships in smart transport and the LEARN! (Leveraging Education to Advance Road safety Now!) initiative of the European Transport Safety Council (ETSC).

In the first half of the project, engagement activities with the Safety Partner Network provided initial knowledge on user needs, characteristics, priorities and concerns, as well as critiques on paradigms used for conceptualizing road danger and the loci of responsibility for URU safety. These data informed our paradigmatic approach and educational philosophy. They were further applied to determining relevance of results for specific KUs, and for creating guidelines on framing and delivering safety messages to ensure acceptance, usefulness, usability and accessibility. In later phases the SPN will be scaled and utilized for wider dissemination of TE&A outputs for purposes of testing, feedback and evaluation.

3. Results

3.1. Framing of safety messaging in TE&A materials

Table 1 provides a summary of guidelines for framing research communications and TE&A interventions to promote URU safety, gathered from a variety of sources. Full details on inputs from the Safety Partner Network and additional sources of data are reported in Nugent (2021, 2022).

Table 1. Guidelines for framing research communications on URU safety and approach to TE&A interventions.

Relevance, tailoring & contextualization	Aspect addressed	Evidence sources
Contextualize within current roadmaps.	Global context, user needs, relevance, alignment with current initiatives, credibility.	SPN; Tingvall, et al., 2022; Parachute, 2022
For general public as target KUs, use positive messaging, not fear-based persuasion.	Promote active mode use in alignment with health and sustainability roadmaps; avoid unintended discouragement of walking, cycling by increasing sense of danger.	SPN; Tingvall, et al., 2022; Wundersitz, et al., 2010
Use current best practice in communicating research about road crashes, road danger.	Aligned with safe systems approach; acceptability, buy-in, trust, credibility.	SPN; Laker, 2021; Parachute, 2021;Teahen, 2021
Show awareness of outdated paradigms.	Include voice of stakeholders: acceptability, buy-in, trust, credibility, best-practice.	SPN; Hagenzieker, et al., 2014; Norton, 2011; Singer, 2022
Design materials that illustrate multiple user POV in crash scenarios, to educate all road users on the specific risks of different URU modes.	Show conflict interactions as predictable of failures and systemic factors rather than focussing on the person as the problem to be fixed.	SAFE-UP (Bálint, et al., 2021); Road Safety; Sweden, 2019; Singer, 2022
Be coherent with Safe systems approach.	Current best practice; relevance, buy-in, acceptance.	de Dobbeleer, 2021; Road Safety Sweden, 2019; Singer, 2022

3.2. Integrated framework for developing road safety innovation TE&A schemes

The schematic in Fig. 1 depicts the essential elements of the education and awareness development framework relevant to the present discussion. The numbered elements in blue tones belong to the KTPT. For brevity, items 4, 11-13 of the KTPT are not depicted. Logically, TE&A schemes fall under the plan component '8-KT strategies'. The 3 key components in course design from constructive alignment are indicated by lettered items in brown tones. The 2-dimensional coding scheme from Bloom's revised taxonomy appear beneath, labelled "Kinds of knowledge" and "Levels of cognitive processing". For more details see Krathwohl (2002), Nugent (2022) and Barwick (2018).

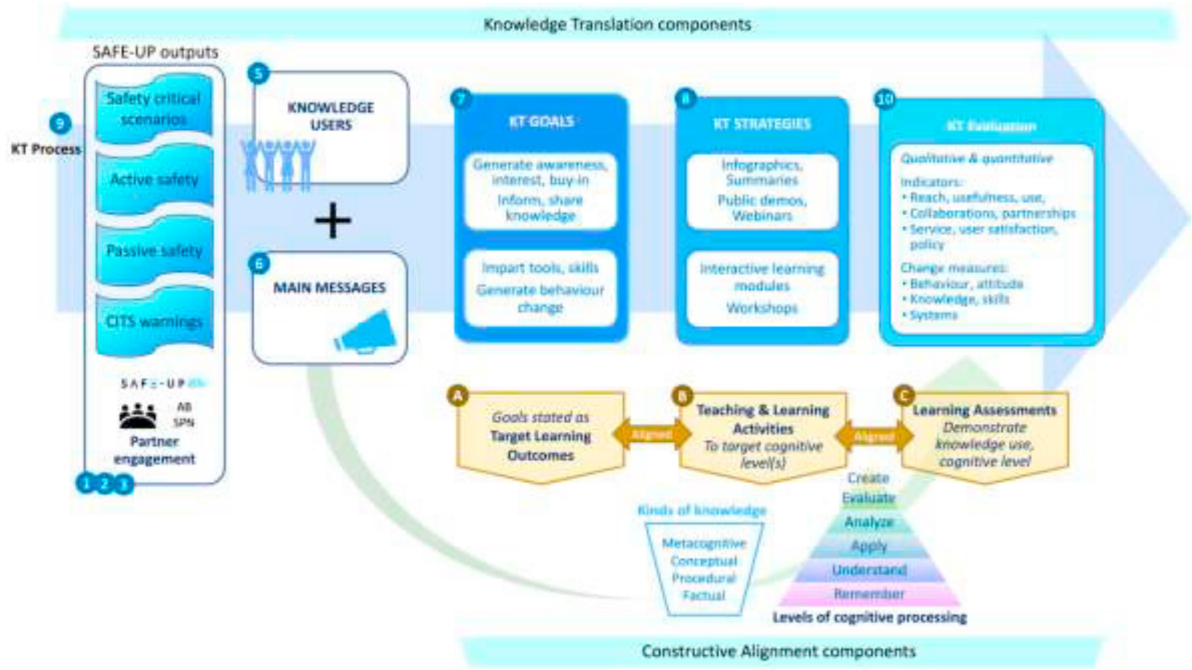

Fig. 1. Framework to guide translation of roads safety research and innovation into training, education and awareness schemes. *AB* Advisory Board, *KT* Knowledge Translation, *SPN* Safety Partner Network.

3.3. Applying the TE&A design framework

This section illustrates how the framework is applied to translate research results into content for TE&A programs. An example is taken from the crash statistics for just one of the 9 SAFE-UP safety critical scenarios for car to pedestrian crashes in current EU urban contexts, identified in Bálint, et al. (2021):

> *In crashes between a passenger car and a person walking, 22.8% of all police reported injury cases and 23.2% of all killed or seriously injured cases happened when the pedestrian was crossing the road from the right of the driver where there was no sight obstruction. In this group of scenarios, 75% of all cases, were not located at or near an intersection, and 55% occur where there is no designated pedestrian crossing.*

Tables 2 and 3 use the sample result above to outline steps 5 through 7 of the KT plan. Table 2 shows the tailored MMs and KT goals for 2 identified KUs. KT goals are then stated as specific evidence-based learning content. The examples target people in driving and pedestrian modes. In applying KT to road safety innovation, there are many potential knowledge users positioned to enhance the impact of the research, such as road safety organizations, researchers, educators in public and driving schools, infrastructure designers, urban mobility planners, policy makers, and enforcers. There are many ways the research result above could be restated as a main message, depending on the audience and goals for sharing. Different interpretations could be drawn by highlighting different aspects of the data for specific use cases. MM, KU and KT goal should be considered together to ensure they are aligned with each other and coherent with the learning objectives. The same procedure would be applied for each determined main message and identified KU.

Table 3 continues the process by restating content items as Learning Outcomes (LOs) – desired changes in knowledge, capacity, behaviour as a result of the knowledge product, learning activity or program. Our approach is to present conflict scenarios from multiple user points of view to promote understanding of each actor’s needs and the contributing factors that interact predictably to result in crashes. For brevity the example shows LOs which are the same for both traffic participants, however, one could define LOs specific to each mobility mode. Each LO is coded by knowledge type and level of cognitive processing (for tip sheets on using the taxonomy, see Nugent, 2021). Drafting and coding of target Learning Outcomes will likely require multiple versions and discussions amongst cross-disciplinary experts to arrive at a consensus on wording and classifications, so what is presented here is not intended as the only/best possible version. While time-consuming, this stage is important, since clearly defined LOs directly inform design of effective strategies and assessment methods (Whetten, 2007). For this example, an LO was created for each cognitive level. In a comprehensive educational program, this ensures there are no gaps in levels of learning. Going from lowest to highest complexity in both dimensions, each LO builds on the foundation laid by the previous one. Thus, the different levels of knowledge and cognitive processing can be logically mapped to specific KT goals and to aid selection/creation of the most appropriate strategies.

Table 2. Applying the KT framework to translate research results

Knowledge users	Main messages	KT goals	Learning content/objectives
Car drivers Pre-licensees	In in urban areas, car drivers should always be alert for pedestrians making unexpected crossings, especially away from intersections where pedestrian crossing is not supported by the infrastructure and vehicle speeds are often higher.	Generate interest, buy-in, awareness Impart knowledge, skills, tools. Generate behaviour change, public action.	Specific dangers, causal factors and types of conflict scenarios between car drivers and pedestrians. Hazard anticipation skills. Conflict avoidance strategies. Self-reflection on behaviour and choices for good decision making. Promote shared responsibility for URU safety.
Pedestrians	In urban areas, away from intersections or designated crossings car drivers may be neither alert nor prepared for pedestrians making unexpected crossings and may not be able to react in time to avoid a collision.		

Table 3. Applying Bloom's revised taxonomy to explicitly define learning goals

Specific learning outcomes on the theme of pedestrian risk/safety *What we want users to be able to do with the new knowledge.*	Type of knowledge	Cognitive processing level
Reconstruct own habits to modify/create evidence-based safer traffic participation behaviour. Explain to others and co-create new strategies. Create community initiatives to devise and implement solutions from a safe systems approach.	**Conceptual** **Procedural** **Metacognitive**	**CREATE**
Self-critique and appraise own habits and choices in traffic participation, reflecting on how these behaviours relate to the predictable conflict scenarios between car drivers and pedestrians resulting in injury and death.	**Conceptual** **Metacognitive**	**EVALUATE**
Analyse examples of (near) conflict situations, differentiating between the different contributing factors, each user's needs and limitations, shared responsibility.	**Conceptual**	**ANALYSE**
Prepare and implement appropriate strategies for (i) safe crossing (from pedestrian POV) / (ii) possible crossings by pedestrians (from driver POV), modifying as needed for the situation.	**Procedural**	**APPLY**
Identify, interpret, predict potential critical scenarios associated with pedestrians crossing at different points with respect to infrastructure in your driving/walking environment.	**Conceptual**	**UNDERSTAND**
Recall and recognize areas of infrastructure posing greater risk to pedestrians for crossing the roadway.	**Factual**	**REMEMBER**

4. Discussion

This paper proposes a framework to aid the development of training, education and awareness raising schemes to promote safety of URUs in relation to current predictable risks and new risks expected to accompany the evolving implementation of CAVs. The framework was developed by integrating two evidence-based systems, each backed by substantial bodies of research, tools, resources and practice referents: KT for targeted dissemination (and implementation) to enhance research impact, and constructive alignment in educational design. The two systems are complementary, each providing processes to facilitate different phases of TE&A strategies development. KT specifically addresses processes and practices – many social – for translating research results into actionable messages and assuring relevance, useability and fit of knowledge syntheses and interventions. Constructive alignment provides a framework that begins with defining target learning outcomes through explicit specification of the level of cognitive processing and type of knowledge required for each. Neither system is domain nor context specific and can be flexibly applied to a wide range of subject matter, users, and user contexts, to achieve multiple types of knowledge and practice outcomes across demographics, organizations and sectors.

At the time the approach was conceived we knew of no standardized flexible framework for TE&A development in the EU. However, the LEARN! framework was later announced in June, 2021 by the ETSC, in a manual to guide educators in developing and evaluating traffic safety and mobility education programs for schools. There is strong resonance between LEARN! and the present framework. Both follow an iterative, non-linear implementation structure including definition of evidence-based learning objectives and production of programs, followed by implementation, evaluation and updating. LEARN! goes further than the present demonstration by including planning to implement programs developed and applying evidence-based approaches to goals for behaviour and attitude change. These features also extend from KT, being a continuum from target dissemination to inform change, to mobilizing interventions into practice. Behaviour and practice change goals require separate implementation plans, referencing appropriate behaviour change and implementation models to ensure success. However, this aspect is beyond the scope of the current paper, and likely of the project. Both systems recognize the importance of designing programs to address all levels of cognitive processing (not just the lower ones), engagement with target audiences (schools) and stakeholder collaboration. It is suggested that the LEARN! manual be consulted as a valuable complementary resource in developing evidence-based road safety programs.

Fig. 2. Relationship between KT goals and KT strategies in applying Blooms taxonomy of educational objectives.

The strategy taken for producing TE&A programs is thus to create materials and learning activities in a variety of formats emphasizing different levels of knowledge from factual to metacognitive, and different cognitive levels, linking these to specific KT goals and strategies. Fig. 2 illustrates how KT strategies can be aligned with the coded learning outcomes. From the knowledge user's perspective, such a hierarchical set of materials could make up a complete learning program, while as separate items, they are accessible for different uses by various audiences, depending on their state of readiness for information at a given level of complexity. This approach is supported by behaviour research on best practice for mass media campaigns in road safety (Wundersitz, et al., 2010), as well studies showing the enhanced effectiveness of multifaceted/combined KT approaches (Barwick, et al. 2021). The next steps are to share the early versions with partners for feedback, scale-up the SPN, and leverage their knowledge and networks to tailor and distribute to their memberships (e.g. end users) for testing and evaluation followed by refinements and updates. We suggest the proposed framework be applied beyond SAFE-UP. For example, to facilitate updating and refinement of the driver instructional programs and assessment methods (and how to integrate training on automated driving functions), which is currently under debate in the EU. The KTPT was designed to aid researchers in drafting and implementing impact plans as required in grant applications. It is hoped this small example will stimulate interest in applying KT science and practices to road safety innovation, to enhance effectiveness of new interventions through engagement and collaboration across sectors. The constructive alignment approach may even be usefully applied to creating more effectively methods for sharing results with policy makers and planners, by explicitly considering the learning aspect of translating often very technical and complicated results to non-experts.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement 861570.

References

ACEM & DVR. European Quality Label Motorcycle Training. https://motorcycle-training-label.eu/

Bálint, A., et al., 2021. D2.6 Use Case Definitions and Initial Safety-Critical Scenarios. Project: SAFE-UP, Horizon 2020 GA 861570.

Barwick, M. A., 2008, 2013, 2019. Knowledge Translation Planning Template©. Toronto, ON: SickKids® Learning Institute.

Barwick, M. A., 2017a. Introduction to Knowledge Translation. [eLearning module]. Toronto, ON: SickKids® Learning Institute.

Barwick, M. A., 2017b. How to Prepare a Knowledge Translation Plan. [eLearning Module]. Toronto, ON: SickKids® Learning Institute.

Barwick, M. A., 2017c. Using the Knowledge Translation Planning Template© KT Planning Reference Guide.

Barwick, M. et al., 2021. Knowledge Translation Professional Certificate – The Manual. Ontario: Hospital for Sick Children.

Biggs, J., 1996. Enhancing teaching through constructive alignment. Higher education, 32(3), 347-364.

CIHR Canadian Institutes of Health Research, 2012. Guide to knowledge translation planning at CIHR.. Ottawa, ON: Retrieved from https://cihr-irsc.gc.ca/e/documents/kt_lm_ ktplan-en.pdf

de Dobbeleer, V., 2021. Traffic safety and mobility education as part of the safe system approach. ETSC LEARN!

ETSC, 2019. Road Safety Priorities for the EU 2020-2030: Briefing for the new European Parliament.

Grol, R., & Grimshaw, J., 2003. From best evidence to best practice: effective implementation of change in patients' care. The lancet, 362(9391), 1225-1230.

Heiden, T., & Saia, T. 2020. Engaging stakeholders for research impact. Retrieved from Austin, TX: https://ktdrr.org/products/KTDRR-Stakeholder-Engagement-Brief-508.pdf

Heiden, T. What is Knowledge Translation? [video] Research Impact Academy. Retrieved from: https://www.youtube.com/watch?v=nW9nPQVatDo

Koppel, S., Bugeja, L., Hua, P., Osborne, R., Stephens, A. N., Young, K. L., ... & Hassed, C., 2019. Do mindfulness interventions improve road safety? A systematic review. Accident Analysis & Prevention, 123, 88-98.

Krathwohl, D. R., 2002. A Revision of Bloom's Taxonomy: An Overview. Theory Into Practice, 41(4), 212-218.

Hagenzieker, et al., 2014. The history of road safety research: A quantitative approach. Transportation research part F: traffic psychology and behaviour.

Laker, L., 2021) Media guidelines for reporting road collisions. Road collision reporting guidelines. University of Westminster Active.l97 Travel Academy. rc-rg.com

McAndrews, C., 2013. Road Safety as a Shared Responsibility and a Public Problem in Swedish Road Safety Policy. Science, Technology, & Human Values, 38(6), 749–772.

Norton, P. D., 2011. Fighting traffic: the dawn of the motor age in the American city. Mit Press.

Nugent, M., 2021. D6.1 Training, education and awareness needs for VRU/URU safety in evolving mixed automated traffic. Project: SAFE-UP, Horizon 2020 GA 861570.

Nugent, M., 2022. D6.2 Knowledge Translation, outreach & safety awareness. Project: SAFE-UP, Horizon 2020 GA 861570.

Panter, J., Griffin, S., & Ogilvie, D., 2014. Active commuting and perceptions of the route environment: A longitudinal analysis. Preventive Medicine, 67, 134-140.

Parachute, 2022. Change for Good Roads: An intersectoral approach to urban road safety. Parachute Canada Vision Zero.

Parachute, 2021. Change the language change perceptions: how we talk about road collisions. Parachute Canada Vision Zero.

Road Safety Sweden, 2019. Vision Zero - no fatalities or serious injuries through road accidents. Government offices of Sweden and WHO.

Singer, J., 2022. There Are No Accidents: The Deadly Rise of Injury and Disaster—Who Profits and Who Pays the Price. Simon and Schuster.

Teahen, K., 2021. Change the language, change perceptions: how we talk about road collisions. Vancouver, BC: parachute.ca/visionzero

Tingvall, C., Michael, J., Larsson, P., Lie, A., Segui-Gomez, M., Wong, S. V., ... & Furas, A., 2022. Saving Lives Beyond 2020: The Next Steps. In The Vision Zero Handbook: Theory, Technology and Management for a Zero Casualty Policy (pp. 1-52). Cham: Springer International Publishing.

Whetten, D. A., 2007. Principles of effective course design: What I wish I had known about learning-centred teaching 30 years ago. Journal of management education, 31(3), 339-357.

Wundersitz, L., Hutchinson, T., & Woolley, J., 2010. Best practice in road safety mass media campaigns: A literature review. Social psychology, 5, 119-186.