D6.4 Training content and material

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Executive summary

The purpose of SAFE-UP is to proactively address new traffic safety issues that are anticipated to come along with the increased use of vehicles with automated emergency and driving features. Changes in the interactions between automobiles and unprotected road users (URUs) - also known as vulnerable road users (VRUs) - could lead to the emergence of new risks. Work Package 6's purpose is to support the technological work packages of SAFE-UP by laying out plans for flexible Training, Educational, and Awareness-Raising (TE&A) strategies and programs that will ensure URU awareness as autonomous vehicle (AV) technology develops and the traffic environment changes in the future.

The current report is the outcome of T6.2 "Training programme content" of WP 6 "Training activities and awareness creation on future traffic scenarios". The objective of this task is to raise road users' general awareness about road safety in future traffic scenarios by enabling knowledge translation of results from transport safety & innovation research, educational material and guidelines.

In the context of this Task the methodology that has been developed in previous WP6 Deliverables, namely D6.1 [3] has been implemented and also the Knowledge Translation (KT) outcomes that have been developed within the framework of T6.3 «Knowledge Translation, outreach and raising awareness», have been enriched and included in our Training, Education & Awareness materials. So, apart from all the existing and new Knowledge Translation material that have been created (within WP6 or other WPs –i.e. demo videos, etc.) **five** e-Learning courses have been developed in the framework of T6.2 to enhance the training, education and awareness of the target audiences regarding the main outcomes of the SAFE-UP project (the SCS and the demos) but also on general road safety issues. The e-Learning platform of SAFE-UP is on moodle and the five developed courses are the following:

1. Drivers' and pedestrians' safety on the road
2. Drivers' and bicyclists' safety on the road
3. Drivers' and PTW riders' safety on the road
4. Automated vehicles today and in the future
5. Getting to know SAFEUP's Demos

All the Training, Educational, and Awareness-Raising (TE&A) material is available at the moment at the project's website but by the end of the project will be all included in one unified place, the Knowledge Translation library hosted also at the project's web site.

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List of abbreviations

Abbreviation	Meaning
AV	Autonomous Vehicles
D	Deliverable
EC	European Commission
KT	Knowledge Translation
KPI	Key Performance Indicator
KU	Knowledge User
LO	Learning Outcome
Lob	Learning Objective
LMS	Learning Management Systems
MM	Main Message
OEM	Original Equipment Manufacturer
TE&A	Training, education and awareness
SCS	Safety Critical Scenarios
URU	Unprotected road user
VRU	Vulnerable road user
WP	Work Package

1 Introduction

1.1 Development of training, education and awareness schemes for future road safety as part of the SAFE-UP holistic approach

In road transport innovation, the four key trends for future urban mobility include connectivity, electrification, shared mobility and automated driving functions [1]. Automated vehicles (AVs) are expected to resolve many road-safety issues, specifically by reducing or mitigating the effects of human error in crash causation, a significant factor in 90% of serious or fatal crashes worldwide [2]. Furthermore, their implementation will represent a step-change in how vehicles and users of all transport modes operate and interact within the transportation network. In SAFE-UP, by proactively developing Safety systems and tools for a constantly change road environment, focus is placed on understanding and effectively addressing the effect of these changes on future road safety. In considering the safety of all traffic participants both inside and outside of vehicles, innovations to Unprotected Road Users (URU – a.k.a. Vulnerable Road Users, VRU see D6.1 [3] and D6.2 [4]) are a high priority in the development of enhanced sensors to detect them in bad weather, advanced automated collision avoidance systems, and connective technology to deliver warnings between drivers and URUs.

Considering that future traffic will result from the increasing penetration of Connected and Automated Vehicles (CAV) among conventionally driven vehicles, new mixed traffic conditions will occur, and new crash scenarios are expected to emerge from the sharing of mobility space with unprotected modes. To cope with these new types of traffic interactions, road users will need to adopt new behaviours, learn to recognize new hazards, and exchange new cues to effectively communicate each other's intentions, thereby ensuring safety between the driver and the URU (D6.1 [3]). Additionally, operators/drivers may need to learn new skills to ensure the proper use of automated vehicles and systems. Road users in general, may need to be informed about changes in road use and new technologies that will impact their behaviour and decision-making. Training, education and awareness (TE&A) schemes are therefore seen as important complements to innovations to protect all road user modes (current/ future) (drivers, pedestrians, cyclists, PTW riders), by targeting diverse audiences including general public, elderly, children, driving schools, general public, as well as OEMs and decision makers (i.e. policy makers, public authorities, ministries), and researchers.

The current goals for road safety in many parts of the world is outline in Sweden's "Vision Zero" initiative, which applies the "Safe System" approach to creating a framework for improving road safety [5]. European Commission has adopted Vision Zero, with a target of close to zero fatalities from road traffic crashes by 2050, while the principles of the Safe System approach provide the guiding framework in the Global Plan for the Decade of Action for Road Safety [6]. Adopting a Safe System approach means considering many systemic

factors constituting different sources of danger in the road transport system that when combined with road user errors may results in a crash. The Safe System approach holds that these dangers are identifiable, so crashes are predictable and thus avoidable. Prevention thus requires integrating knowledge from multiple sources of evidence, multiple perspectives, and leveraging multiple disciplines to collectively create effective, timely and sustainable solutions (D6.1 [3]).

Road users may need to be informed about traffic participation changes and new technologies that affect their behaviours and choices. Thus, training, education and awareness raising are seen as important complements to innovation for protecting road users, however the burden of responsibility for safety cannot be placed solely on those most exposed to road danger.

The challenge facing WP6 is to determine a method for educating and informing behaviour and practice change to improve URU safety in current and future safety-critical scenarios, based on the current (and evolving) knowledge. The main objective of Task 6.2 was to define the content and develop the TE&A materials addressing the safety issues of selected safety-critical scenarios (derived from WP2), to be used online and potentially offline, for all targeted user groups, applying the methodological frameworks established and reported in D6.1 [3] and in D6.2 [4]. The scope of all WP6 tasks was to develop a systematic approach for translating new knowledge from project outcomes into accessible, actionable formats through key messages and strategies to promote safety of Unprotected Road Users (URUs) in an evolving mixed automated traffic context. In doing so we have applied practices and principles of Knowledge Translation [4] which promotes uptake of research knowledge for public benefit through targeted dissemination and stakeholder engagement, in contrast to traditional research dissemination methods which rely on passive diffusion of knowledge.

The initial content for the educational and informational products in development (e.g. infographics, videos, tip sheets, research syntheses, e-Learning modules) was provided by the WP2 deliverable D2.6 on initial (current) safety-critical scenarios identified from analyses of EU and German crash databases [4]. KT principles and processes combined with current concepts in educational theory (learning outcomes approach, constructive alignment) were combined to create a guiding framework, as for application in developing dissemination of road safety innovation research D6.2 [4]. For specific educational/awareness goals by targeting and tailoring results for specific audiences. These approaches have been adopted to ensure that the evidenced based safety messages are comprehensible and engaging for the targeted audiences.

Additional TE&A targets were also identified within T6.2 from surveys of current safety initiatives, organizations and identified priorities and inputs from URU advocacy groups (see D6.1 [3]). This report details the TE&A priorities established, defined holistically in terms of each key message, its target audience and desired learning outcome, and presents the TE&A materials developed within T6.2 based on these targets.

In creating materials and strategies to educate and inform diverse road users on road dangers and the innovation technologies being developed to anticipate mitigate them we have tried to take a learner-centred approach to create relevant, engaging materials and

activities that help road users to make better choices about their own safety and the safety of others.

1.2 WP6 flow and connection to other work packages

The overarching logic flow for WP6 activities goes as follows:

1. Develop processes (Knowledge Translation for Road Safety Innovation, the Safety Partner Network) carried out in T6.3, to support all WP6 tasks.
2. Adapt frameworks (T6.1) (KT Plan + Constructive Alignment for design of educational programs) and apply them to the SAFE-UP results (T6.2).
3. Create outputs as working examples for TE&A approaches to future URU safety (T6.2).
4. Test and collect feedback (T6.4) on programs and materials developed, with inputs from external stakeholders (SAFE-UP advisory board, AB, expanding SPN and public).
5. Report on the (estimated) performance, acceptance and usability of TE&A materials and programs, with lessons learned, suggestions for further development, implementation, and measurements of use and uptake. (T6.4).

The organizational structure of SAFE-UP's different technical and non-technical activities is illustrated also at the following Figure 1. From the expected outcomes of SAFE-UP (ongoing at time of writing), the following themes provide the safety information content for TE&A objectives.

- WP2 – The **initial** and **future** Safety Critical Scenarios (SCS) defined in WP2 provide knowledge on existing and evolving road traffic risks to URUs in interactions with passenger cars.
- WP3 Demo 1 – information on **occupant monitoring and restraining systems** SAFE-UP developments. Knowledge and understanding new seating positions and safe use of adaptive restraint systems for highly automated vehicles, with relevance to highway Safety-Critical scenarios.
- WP3 Demos 2 & 3 – information on the **new safety technologies**, such as enhanced sensors for better URU detection in bad weather and automated emergency avoidance manoeuvres. Knowledge and understanding of intended use cases, proper use and system capabilities and limitations in operating domain and response characteristics which could have safety and responsibility implications for both occupants and unprotected road users outside the vehicle.
- WP3 Demo 4 – gaps in and promotion of increased **road user connectivity** associated with increasing AV penetration and future implementation of CITS systems to support crash avoidance and URU safety.
- WP7 – information and knowledge regarding **pathway towards Connected and Automated Vehicles (CAVs)** including business, technology and policy drivers defining a plausible and coherent long-term future scenario.

- WP5 – Considering that T6.2 activities must be completed by M30 and the results delivered in M32, Information from WP5 outputs related to Active and passive safety system assessment cannot be included in the current deliverable. It is hoped that details on the possible impact of the systems can be included in later TE&A materials, before evaluation which will take place around M34.
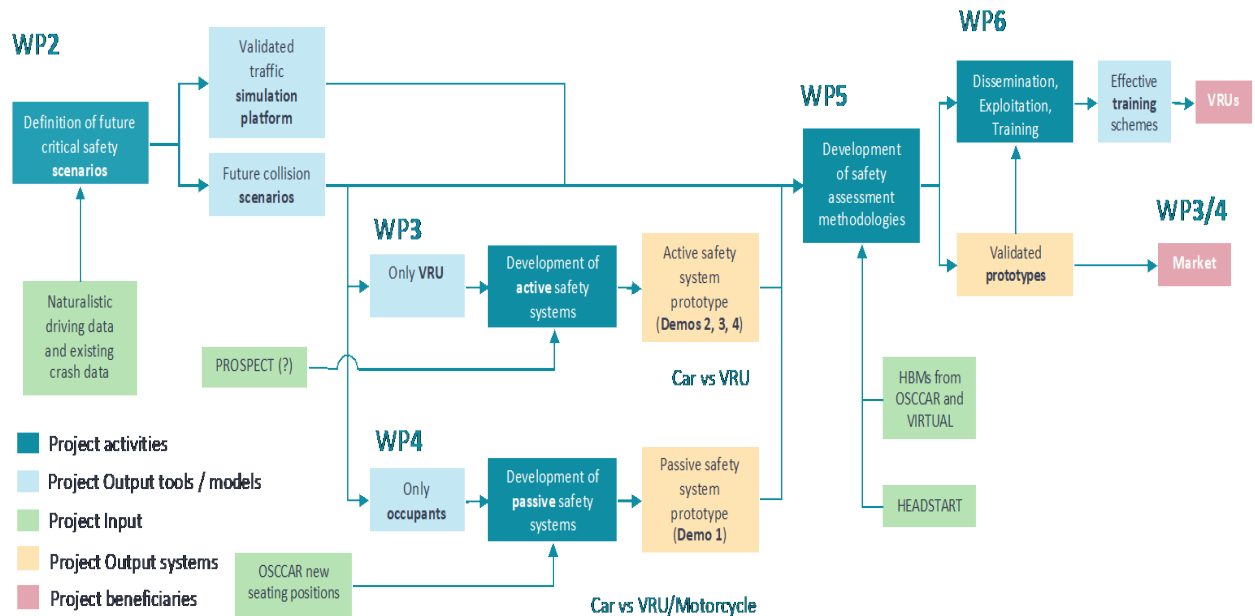
Figure 1 SAFE-UP project approach and interrelations among WPs.

1.3 TE&A schemes and products – main principles and targets

In the context of D6.1, 5 main principles for developing TE&A schemes and materials were identified, defined briefly here.

1. **Shared responsibility & the Safe Systems approach**

Principles from the Safe System approach, as well as the concept of shared responsibility were identified to guiding developing strategies and framing safety messaging of training and educational material in order to be aligned with current paradigms of road safety and vulnerable road user concerns and rights. This topic is described further in Section 4.1

2. **Engagement with stakeholder groups and research knowledge users throughout the project**

Engagement with various stakeholder groups for knowledge exchange has been implemented throughout the project in accordance with KT best practice. Their engagement has helped inform WP6 researchers on gaps in knowledge about URU perspectives and to aid in determining relevance of project results for appropriate framing of Learning Outcomes and tailoring TEA strategies to different target knowledge users (see TE&A materials Table 2).

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3. **Multi-stage approach to developing TE&A content and objectives**

Creating training and awareness schemes relevant to a future traffic reality that does not yet exist in humans' everyday lives is almost impossible. In SAFE-UP we are managing this challenge by starting with the current identified safety-critical scenarios. This approach provides the opportunity to address current gaps in transferring up-to-date road safety research to multiple sectors, for purposes such as education, awareness raising, policy making, and more. This initial focus of our first phase in TEA development on current safety critical scenarios also provides contextualization and rationale for current automation technology and how SAFE-UP innovations will contribute to AV safety in mitigating current and future SCS.

On process and methodology level, in proposing, implementing and testing a framework for translating and disseminating road safety innovation research to ultimately enhance its impact, we hope to provide tools for future use by researchers, OEMs and public organizations. The flexibility of the combined KT + training development framework [see D6.1, D6.2] also allows updating to integrate emerging results from research (SAFE-UP and beyond) and practice (road users, public, charities, policy makers, planners, etc.) to match the pace of changes in mixed AV traffic, which was a requirement of the SAFE-UP grant agreement.

4. **Multi-level approach to target audiences**

In keeping with the safe systems approach and concept of shared responsibility (refer to Section 4.1), in considering possible knowledge users of our TE&A products, we identify target audiences across the road safety system. Thus, the evidence-based safety messages are not directed only at road users themselves. In addition to being accessible to the general public, educators and driving schools, materials are also intended for dissemination use by those who have the power and authority to use SAFE-UP outcomes to reduce systemic dangers, such as policy makers, planners and government. Materials in multiple formats and levels of detail, from infographics to educational e-Learning modules (described in Section 4) will be accessible, downloadable and shareable from the SAFE-UP website.

5. **Educational design models adapted from research on higher education**

The methodology developed in D6.1 draws on learner-centred approaches and current best practice trends in learning research and educational design (described in Section 2.2). The application of the learning outcomes approach, together with constructive alignment principles and Bloom's revised taxonomy for defining educational objectives was originally proposed during drafting of the grant proposal. Since that time, further investigation revealed that this approach has been adopted and expertly implemented by the Insurance Corporation of British Columbia in the development of guidelines for approved car driver and motorcycle rider training programs (see ICBC.com/partners). We have adopted many of their identified learning outcomes and content items in the development of our e-Learning courses.

1.4 Organization of Deliverable 6.3

The current report includes 7 Chapters. Chapter 1 introduces the aims and approach for developing training, education and awareness schemes on SAFE-UP outputs and how TE&A topic has been handled throughout the project's lifecycle. Chapter 2 describes the implementation of the methodology developed in D6.1, resulting in the TE&A materials

developed and presented in this document. Chapter 3 includes some examples of existing campaigns and courses related to road safety and automation. Chapter 4 makes up the core of the document, explaining and presenting in detail all the TE&A materials developed in SAFE-UP. Chapter 5 provides a discussion of future steps for research and development related to training, education and awareness raising on future mixed traffic scenarios and finally Chapter 6 provides a summary of all this work that has been realised.

2 Methodology and implementation

2.1 SAFE-UP Training Education & Awareness methodology

The methodological framework supporting the development of SAFE-UP's Training, Education & Awareness schemes has been reported in detail in D6.1 [3]. Here we provide the reader with a brief overview of the methodological framework which was based on a freely available tool, the Knowledge Translation Planning Template© [10].
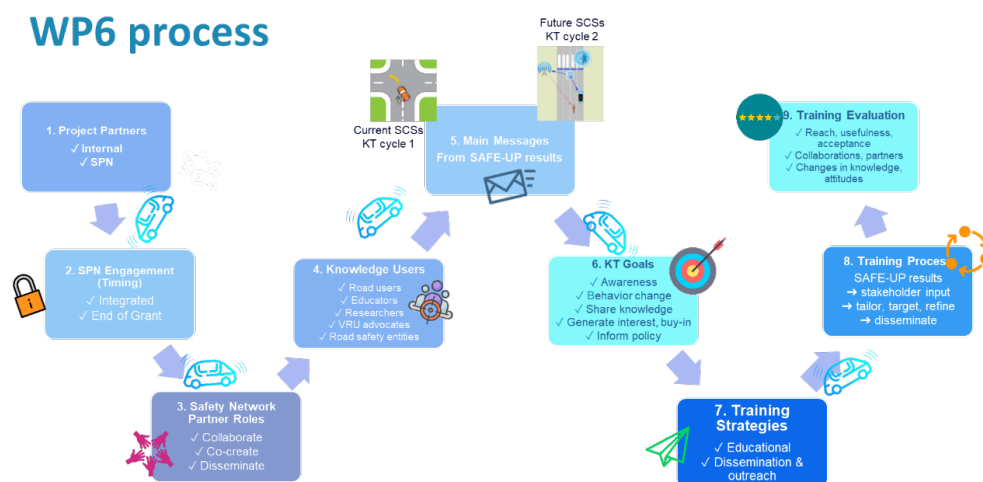
Figure 2: WP6 process in a nutshell

To easily visualize WP6 objectives and overall workflow Figure 3 shows a simplified version of the SAFE-UP KT plan for developing training, education & awareness schemes. Although depicted linearly, the plan is implemented non-linearly and iteratively. Early in the project, a list of 49 potential partner organizations was derived from web searches and recommendations from SAFE-UP internal partners and advisory board. Of these, 17 were selected as first priorities for engagement in the ad hoc Safety Partner Network (SPN), and Initial email letters were sent announcing SAFE-UP and describing the project. The organizations interested in participating in WP6 ongoing activities (see deliverable D6.2, Figure 4.2 for details), after completed an online form detailing organizational purpose, common points of interest with SAFE-UP aims, and specific types of engagement and contributions to be made (in principle). Target audiences, defined as knowledge users by KT practice were also identified as any people and/ or organizations who could use and benefit from the SAFE-UP outcomes. Initial Main Messages from results were drafted tailored by KU group, and were later updated/refined during the TE&A materials development process. KT goals for sharing SAFE-UP results were defined in D6.1 to guide WP6 progress and development of TEA strategies. The goals, Main Messages, Knowledge Users, as well as the desired learning outcomes to result from safety knowledge sharing

allowed us to create tailored training strategies in the form of informational and educational learning materials and activities, which will be evaluated in the last phase of the project by actual users and members of the SPN.

The SAFE-UP approach to developing training and educational materials is follows the outcomes-based learning approach from educational theory, in contrast to a curriculum centred approach. Adapted to SAFE-UP aims, relevant research outcomes are stated as Main Messages – what target audiences need to know and understand (overall goals for learning and knowledge use). Then specific desired learning outcomes are defined – what learners should be able to do and understand, and what values and behaviours are desired. The elements of constructive alignment are also applied by identifying the knowledge type and cognitive processing level required for each learning outcome and designed aligned teaching and learning activities and assessments. This comprehensive framework integrating KT of research to the SOA in educational models, follows the learner-centred approach which recognizes that learners need to be active in their own learning, each learner has unique rates of learning, learning happens in group settings and in individual situations, and learning is most effective when it happens through personal experiences [7].

2.2 Implementation of Training Education & Awareness methodology

One of the aims of effective Training, Education & Awareness strategies is to promote thinking, competent road users who make good choices for their own and others' safety. By combining the nested frameworks of the KT Plan and the educational design the aim is to translate and link SAFE-UP results to the desired user-level outcomes that bring about the proposed safety benefits, as it is illustrated at the following figure.
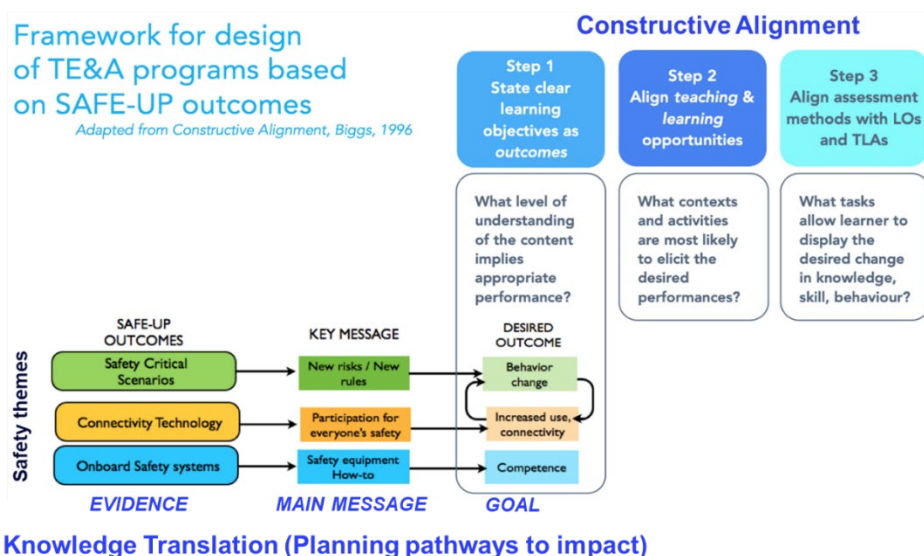
Figure 3 Nested KT & Constructive Alignment frameworks for translating SAFE-UP outcomes into TE&A programs

Starting from evidence-based results that derive from SAFE-UP activities, we define the Key Messages (Main Message) that need to be passed to the audience (Knowledge Users) and create specific goals (Learning objectives & Learning outcomes). Then, designing teaching and learning materials/activities using Constructive Alignment, the specific individual Learning Outcomes needed to achieve the learning goals are proposed. Now we are ready to decide what Training strategies or teaching and learning activities would be most effective by aligning them with the stated Learning Outcomes. For example, if a couple of LOs is that the learner should be able to describe typical high risk traffic scenarios for pedestrians and analyze a real scenario for potential hazards and choose the best solution, materials could include infographics on safety-critical scenarios and exercises and discussion questions asking learners to analyze examples and explore the consequences of different behavioural choices. As mentioned in D6.2 [4] distinguishing between T6.2 and T6.3 subtasks (educational & training programs vs Safety Media Library and outreach dissemination, respectively) will depend on the strategies chosen for each goal. Lower cognitive goals such as informing for understanding and recognition can be achieved through infographics, while interactive e-Learning approach can provide a more focussed educational approach. Thus there is supportive and productive overlap between tasks as we expect to produce a range of materials in different formats for different audiences, but based on the same piece of evidence (tailoring and maximizing reach), and accessible at different levels of cognitive involvement, depending on user needs. For example, if a desired Learning Outcome is to share new knowledge of specific risk scenarios, this can be done through infographics, research summaries or tip sheets shared with broad audiences. Thus, a given knowledge product can be used in both general dissemination and as background information for training purposes. Both types of approaches and associated materials can also form different aspects in a comprehensive TE&A approach.

Initial Safety Themes / Issues based upon project's objectives and activities, inputs from SPN and EU urban mobility and safety themes have already been reported in D6.1 [3] and represent the knowledge content areas from which to develop the main messages and TE&A objectives. These initial Safety Themes / Issues have been further refined and updated as the project has progressed and results from other work packages has emerged. The process for developing TE&A materials is evolving and iterative. The final Safety Themes / Issues are presented in Table 1 along with the proposed target audiences. The target audiences considered, range from 'end users' (people interacting in traffic, road users, consumers) to 'next Knowledge Users', for example road safety associations, pedestrian, cyclist and motorcyclist advocacy groups, policy makers, other researchers – any entity who can use the knowledge produced in SAFE-UP in their work to positively impact URU safety in current and future traffic.

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Table 1: Safety Themes/ Issues with priority order based on D6.1

Priority order	Safety Theme / Issue	Target Audience(s)
1	Safety Critical Scenarios - SCS- (current and future)	• All road users • OEMs • Public authorities • Decision makers • Researchers
2	Demo 1: New seating positions for highly automated vehicles Demo 2: VRU detection under bad weather conditions Demo 3: Enhanced sensors & active safety for URU detection and avoidance Demo 4: Communication framework for warning VRUs	• All road users • OEMs • Public authorities • Researchers
3	Automation in transport today and in the future	• All road users • Public authorities
4	Engaging URU stakeholders in planning & implementation of road safety innovations	• OEMs • Public authorities • Decision makers • Researchers

Themes 1 and 2 are the first priorities for meeting WP6 objectives. Themes 3 and 4, *Automation in transport today and in the future* and *Engaging URU stakeholders in planning & implementation of road safety innovations* are considered "wish list" items, to be addressed if time and resources allow.

Based upon the Themes of Table 1, specific Main Message have been determined from the evidence, which apply to specific Target Audience (Knowledge Users). Each Main Message has been broken down into clearly stated target Learning Outcomes, written as active verb statements describing specifically what learners should be able to do, or how their attitudes and behaviour should change [3]. Each Learning Outcome is coded according to the type of knowledge and cognitive process, based on the Bloom's revised Taxonomy of Educational Objectives (Figure 5), described in Krathwhohl (2002) [8] as a tool for clearly defining Learning Outcome statements from learning objectives.
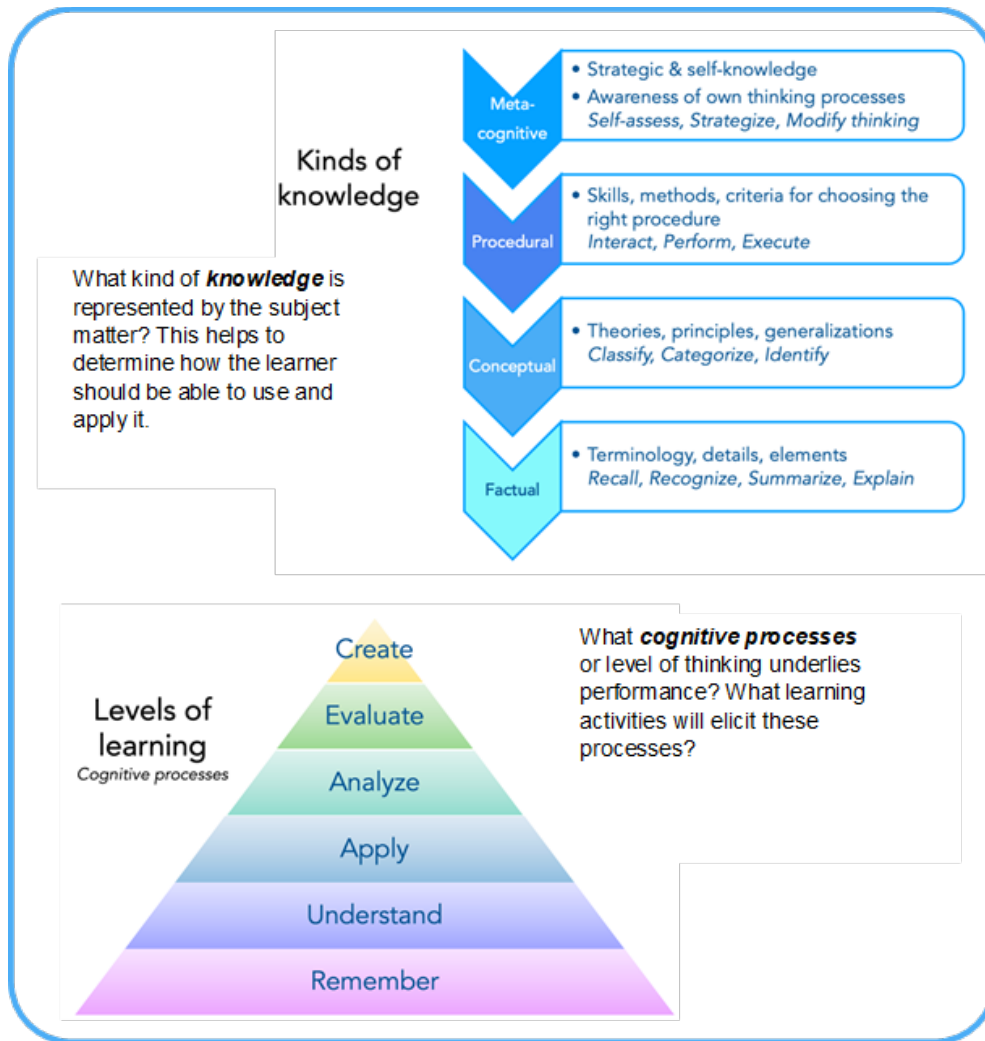
Figure 4: Bloom's revised Taxonomy of Education Objectives. Source: Nugent, 2021.

Based on the Main Messages from D6.1 and their refinement throughout these months of the project, a list of 6 overall Main Messages was derived. These Main Messages, which were all evidence based through the SAFE-UP tasks or stakeholder engagement (SPN), allowed us to develop the Learning Objectives for road safety courses. The scheme below illustrates the mapping between the Main Messages (and the evidence they were based upon) and the respective (multiple most of the times) Learning Objective/s (Lob). In most cases one Main Message (MM) corresponds to more than one Learning Objective and vice versa, one Learning Objective might emerge from multiple Main Messages.

MM1: Results on car-to-URU crash frequencies and factors must be translated to be **appealing**, **relevant** and **accessible** to the specific stakeholders & external expert audiences.
Evidence: Input from SPN and SAFEUP partners

MM2: SAFE-UP is developing new technologies to reduce the occurrence of crashes by compensating for human errors and sensory limitation and all road users should be familiarized with them.
Evidence: SAFEUP Demos

MM3: New analysis on crashes between passenger car drivers and pedestrians and cyclists highlight the most **frequent scenarios resulting in serious injury** or death to pedestrians.
Evidence: T2.1 results in D2.6: Initial Safety-Critical Scenarios

MM4: In future traffic, AVs will not commit traffic violations that put pedestrians & cyclists at risk. Until then, we can all do our part to keep unprotected road users safe.
Evidence: T2.1 results in D2.6: Initial Safety-Critical Scenarios

MM5: New understanding of car-to-URU interaction failures shows how CITS will help everyone avoid crashes and keep people walking and cycling safe.
Evidence: T2.1 results in D2.6: Initial Safety-Critical Scenarios

MM6: Future automated driving functions will help reduce the number of crashes caused by traffic violations, mistakes and misjudgments. Until then, we all need to understand why crashes happen and how we can prevent them.
Evidence: T2.1 results in D2.6: Initial Safety-Critical Scenarios

MM7: Even combined with automated avoidance systems, there are limitations to how quickly vehicles can respond to avoid a collision. It is important for the public to understand what situations these systems can handle, and what would be the risks if the situation exceeds their limitations.
Evidence: SAFEUP Demos

LOb1: Adopt respectful and responsible attitudes about driving which contribute to community safety

LOb2: Understand that today's driving is a complex activity that requires training, education and experience

LOb3: Improve and continuously update defensive driving and communication skills

LOb4: Appreciation and increase of use of connectivity tools that provide warnings and communications

LOb5: Understand the safety benefits of new connectivity tools and utilize them effectively to receive warnings and communications between VRUs and other road users

LOb6: Adopt respectful and responsible attitudes towards road safety

LOb7: Enhance perception and anticipation of risks associated with existing and new traffic patterns, AVs, and different vehicle occupant roles

LOb8: Identify risks associated when crossing transition zones having different levels of digital or infrastructural safety support, or automation levels

LO0b9: Understand what Connected and Automated vehicle are and familiarize with their functions, presence in traffic, benefits and limitations

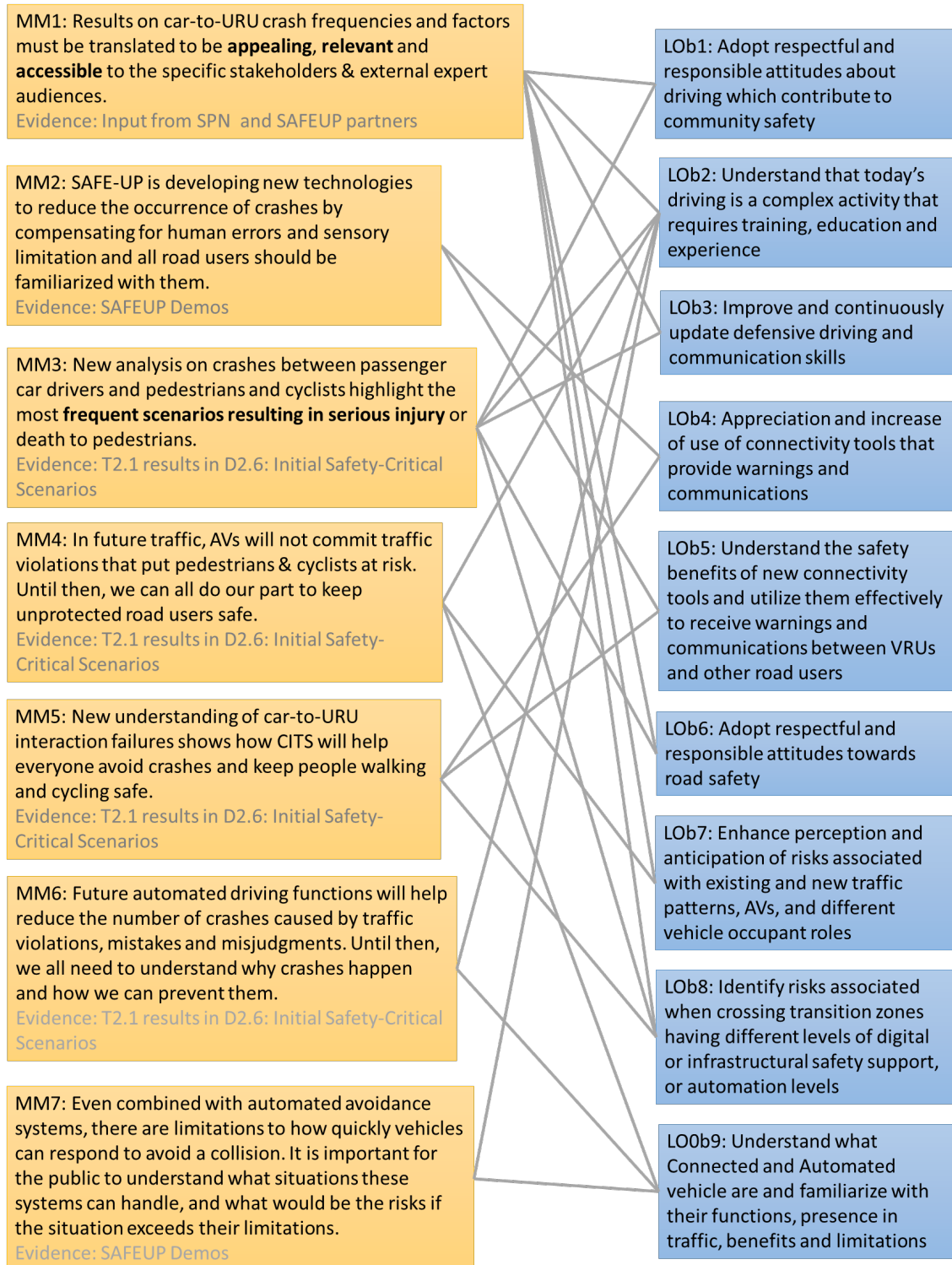Figure 5: Mapping of Main Messages (MM) from research to Learning Objectives (Lob) to meet the SAFE-UP training, education and awareness-raising objectives.

The Learning Objectives of the materials to be developed are deeply depended to the target audience they are focusing on. Sometimes the same material might have a different objective for different target audience based on the educational needs each target audience

has. Table 2 presents the knowledge user types together with the relevant TE&A objectives (from Table 4.5 of D6.1) for each one.

Table 2: Learning Objectives and corresponding potential knowledge users

General Goals for Learning	Potential Knowledge Users									
	Drivers	URUs	General public	School boards, educators	Driving schools, driving instructors	Road transport & safety professionals	Researchers	Private sector, industry and OEMs	Road safety advocacy groups	Decision makers, policy makers and governments
LOb1: Adopt respectful and responsible attitudes about driving which contribute to community safety	X	X	X		X	X			X	X
LOb2: Understand that today's driving is a complex activity that requires training, education and experience	X	X	X		X				X	X
LOb3: Enhance existing defensive and driving communication skills	X				X					
LOb4: Appreciation and increase of use of connectivity tools that provide warnings and communications	X	X	X			X		X	X	X
LOb5: Understand the safety benefits of new connectivity tools that provide warnings and communications between VRUs and other road users	X	X	X			X	X	X	X	X
LOb6: Develop respectful and responsible attitudes towards road safety	X	X	X	X	X	X		X	X	X
LOb7: Enhance perception and anticipation of risks associated with existing and new traffic patterns, AVs, and different vehicle occupant roles	X	X	X	X	X	X	X		X	
LOb8: Identify risks associated when crossing transition zones having different levels of digital or infrastructural safety support, or automation levels	X	X	X				X			
LOb9: Understand what Connected and Automated vehicle are and familiarize with their functions, presence in traffic, benefits and limitations	X	X	X	X	X	X		X	X	X

The Learning Objectives (LObs) have been used to create the TE&A materials and their learning outcomes. These are detailed in Section e-Learning courses.

3 Examples of Training, education and awareness for road safety

Some existing examples of awareness and behaviour change strategies related to traffic safety, VRUs, automation and all the topics that could be of interest for SAFE-UP are presented in this chapter.

1. "Risk Up" campaign.

The UK has an extended strategy that covers all Vision Zero related pillars. The "user behaviour" was tackled through its "Risk Up" campaign. Some examples of this campaign are provided in the figures below.

Figure 6: "Risk Up" campaign materials. Source: Transport of London "Vision Zero action plan, Taking forward the Mayor's Transport Strategy", 2018. Available at: https://content.tfl.gov.uk/vision-zero-action-plan.pdf)

Starting in 2018, the campaign strategy was a series of incisive and targeted marketing and engagement campaigns calling out the most dangerous road behaviours of drivers, with a focus on reducing inappropriate speed.

2. Parachute Canada Vision Zero campaign

In 2018, Parachute launched a national awareness campaign, supported on social media and through donated billboard space related to how we talk about road collisions and how we should talk about them.

Figure 7: Parachute Canada Vision Zero campaign Source: Parachute Canada Vision Zero. Available at: https://parachute.ca/en/program/vision-zero/)

"This was not an accident" drove people to information on the importance of changing public perception that crashes are not accidents but are preventable through changes in how roads are built and how drivers used them. This paradigm shift is key to building support for Vision Zero initiatives.

3. Delft road safety course

Every year a road safety course is held in Delft. The course is aimed at road safety professionals who are active or are going to be active in the road safety field. The course is divided into two parts, the first part consisting of six weeks of online lessons and the second part being five days of classroom lessons. The course includes presentations, road safety discussions, group work and field trips.

More information can be found at https://delftroadsafetycourses.org/

4. Safety center road safety training

Safety center has introduced two courses related to road safety. The first one provides an immersive driver training experience through a driving simulation designed for teenagers or newly licensed drivers. For more information see https://safetycenter.org/

The other course is about middle school bike and pedestrian safety education, building a foundation for making safe driving decisions in the future and reversing the growing trend of bicyclist and pedestrian involved crashes.

5. RSA Ireland road safety training

RSA Ireland has set up a nationwide road safety education service. An RSA team member visits your location to present effective programmes which tackle all elements of road safety. They also offer Road Safety Education Programmes that are available for teachers and community leaders to deliver themselves following a train-the-trainer session. In 2022 they also created a virtual road safety education training program through a 3D learning portal that offers a first-class and age-appropriate immersive learning experience for students.

For more information see https://www.rsa.ie/road-safety

6. Waymo's public education campaign "*Let's Talk Self-Driving*"

Waymo's public education campaign "*Let's Talk Self-Driving*" is a Self-Driving Curriculum that allows the audience to learn about road safety and get an inside look at the future of fully self-driving technology. It was created in partnership with Mothers Against Drunk Driving (MADD), Students Against Destructive Decisions (SADD), and Waymo's public education campaign "*Let's Talk Self-Driving*".

For more information see https://ltad.com/resources/autonomous-driving-curriculum.html

7. EIT Urban Mobility course on autonomous vehicles

This short course by EIT gives the audience a full understanding of the automated vehicles framework, the technologies, challenges, and opportunities of their adoption as a key element in urban mobility. It includes 4 modules for a total length of one hour and a half.

Check the e-Learning course here https://urbanmobilitycourses.eu/courses/autonomous-vehicles/

8. World Bank Group Road Safety Course

This course offers an introduction to road safety, the effects of crashes and fatalities, statistics on global mobility, and the global strategy for safety improvement. Much of the content is devoted to the role of road infrastructure from the Safe System perspective, with examples from around the world. Additionally, the course examines strategies for implementing safety, providing case studies of effective initiatives from around the world. The course also examines how the World Bank manages projects and conducts capacity reviews to increase road safety.

Check the e-Learning course here https://olc.worldbank.org/content/think-road-safety-road-safety-training-external-partners-self-paced

9. NHTSA pedestrian safety Training program

This course is designed for Highway Safety Office professionals tasked with coordinating pedestrian safety programs. Other participants who would benefit include: State and community coordinators of pedestrian safety, managers, law enforcement liaisons, pedestrian and bicycle coordinators of Transport Departments, program managers of State DOTs, and nonprofit organizations. Participants who go through this course will be able to manage a comprehensive program to successfully reduce pedestrian crashes and create

more walkable communities by developing familiarity with program manager guidelines, tools, and templates.

More information can be found here https://www.nhtsa.gov/pedestrian-safety/pedestrian-program-training#overview

4 Training, education and awareness material for road safety enhancement in SAFE-UP

4.1 Current contexts for developing a new approach to training, education and awareness for URU safety.

The approach taken to developing TE&A schemes according to the objectives of the SAFE-UP grant agreement must be firmly grounded and contextualized within current human-centred road safety paradigms and objectives. We can describe this no better than the original authors of Vision Zero, the Swedish road safety authority [9]:

> *Vision Zero is an ethical stance stating that it is not acceptable for human mistakes to have fatal consequences. It can be viewed as a paradigm shift, where the ultimate responsibility for road safety is shifted from the individual road-user to those who design the transport system, for example, road management bodies, vehicle manufacturers, legislators, commercial transport operators, the police authority and others. The responsibility of the road-user is to comply with laws and regulations.*

> *Traditional road safety management has put a lot of effort into accident prevention, and most accidents are caused by road-users. The aim of such strategies is therefore to try to create the perfect human who always does the right thing in all situations. If an accident happens, the blame can almost always be put on a road-user.*

> *Vision Zero challenges this approach. Instead, it is assumed that there are no perfect humans. It is human to make a mistake, but mistakes should not cost a person's life or health. Instead, much effort is being put into designing the transport system so that accidents will not lead to serious consequences. The focus is on the roads, the vehicles and the stakeholders who use the road transport system, rather than on the behaviour of the individual road-user.*

In developing evidence-based TE&A schemes from SAFE-UP outcomes, we try to find a balance in our messaging between the role of individual responsibility for their safety and the recognition that "the Safe System approach opposes the often-repeated but simplistic claim that driver error is the cause of 90% of road fatalities. At best, driver error is the last failure in a causal chain of events leading to a crash (WHO, 202: 9)" [10]. Indeed, "Overstating the role of road-user error may result in a reduced focus on effective countermeasures that address systemic failures in this causal chain" [10]

In the safe systems approach, crashes are viewed through a lens which analyzes the system within which they occur – systemic combined factors, of which human error is just the final

step. This conceptualization of interacting dangers that culminate in road crashes is illustrated in the now famous Swiss Cheese model of James Reason's (see insert below which presents of danger in systems, and how various factors line up to produce 'accidents'.

Since these factors are shown to be identifiable and predictable and thus preventable, use of the term 'accident' is increasingly removed from research and communications, with crash or collision being preferred as more representative of reality. For example, *"The British Medical Journal banned use of the term 'accident' because it conveys an undue sense of faultlessness and inevitability."* [11] The 5 principles of the Safe System Approach (Figure 7) highlight the need to go beyond victim-blaming or the unethical expectations that "Road users should not have to operate in [or adapt to, be blamed for] a system full of flawed designs that increase the probability of error."

Shared responsibility is not equal across road transport sectors and users because not all parties have equal power to remove or reduce road dangers and their consequences. The 6 pillars of the Safe Systems approach illustrate this hierarchy of power to improve and ensure road safety. Note that safe road-user behaviour is fifth.

Figure 1. The five key components of the Safe System framework

	Key component	Description
	1. Establish robust institutional governance	Permanent institutions are required to organise government intervention covering research, funding, legislation, regulation and licencing and to maintain a focus on delivering improved road safety as a matter of national priority.
	2. Share responsibility	Those who design, build, manage and use roads and vehicles and provide post-crash care have a shared responsibility to prevent crashes resulting in serious injury or death.
	3. Strengthen all pillars	When all road-safety pillars are stronger, their effects are multiplied; if one part of the system fails, road users are still protected.
	4. Prevent exposure to large forces	The human body has a limited physical ability to tolerate crash forces before harm occurs; the system should prevent those limits from being exceeded.
	5. Support safe road-user behaviour	While road-user errors can lead to serious harm, the Safe System focuses on roads and vehicles designed for safe interaction with road users. It supports humans *not* to make mistakes and tune their tasks as much as possible to their competencies.

The **6 pillars** of the safe systems approach

1. Road-safety management
2. Safe roads
3. Safe vehicles
4. Safe speeds
5. Safe road-user behaviour
6. Post-crash care

Figure 8. The 5 key components and 6 pillars of the Safe System approach to road safety. Source: [10]

While we agree the ideal situation is to remove and mitigate systemic road danger, e.g. through lower speed limits in urban areas, safer vehicles and better infrastructure design, we must recognize that road users still have responsibility for making good choices on our streets and roads to protect their own safety, and that of others. We also acknowledge that the traffic contexts are continuously evolving, and that driving automation technology is still not mature. Thus, there continues to be a role for public education on the proper uses of safety technology, its intended use cases and limitations. At the same time, we must be aware of climate change actions towards urban sustainability and improving citizens' health and well-being, including messages on the necessity of safe space for active travel modes such as walking and cycling.

"A further evolution in injury prevention theory has been James Reason's focus on systemic organisational weaknesses. His work, illustrated by the "Swiss Cheese model" of injury causation, shows how active and latent failures can open "a trajectory of accident opportunities" (Reason, 1997). To avoid this negative outcome a layered system of defence or "cumulative acts" are proposed that will avoid exposing a single point of weakness that would otherwise lead to injury."

Source: ITF (2016) Zero Road Deaths and Serious Injuries: Leading a Paradigm Shift to a Safe System, p. 20.

Figure 1.1. **Reason's Swiss Cheese Model applied to road safety**
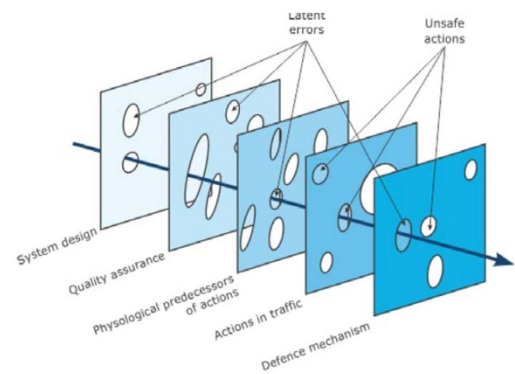
Figure 9: Excerpt from "Zero Road Deaths and Serious Injuries: Leading a Paradigm Shift to a Safe System". Source:[12]

Considering that "Today, the Safe System approach is at the centre stage of road-safety policy making at the global, regional and national levels" [10], any interventions to enhance road user safety, including educational and public awareness raising strategies should be contextualized within the current paradigm and aligned with its principles.

4.2 Evidence-based knowledge products to supplement e-Learning modules

So far during the progress of the project and WP6, several sets of Knowledge Translation products, such as infographics summarizing WP2 results, have been developed. They are available as stand-alone items for general dissemination. They are also intended as educational content for the e-Learning courses. The Sections below present the KT items developed within WP6 but also in other WPs that have been used for the courses' context.

Of course, apart from the KT items, also information from formal Deliverables (i.e. D2.6, D3.3, D7.3, etc.) has been used in order to provide technically correct information.

4.2.1 Infographics

The infographic format has been chosen as a straightforward way for translating research results on Safety Critical Scenarios for sharing with broad audiences, with the general purposes to inform, generate interest (fulfilling Task 6.3 objectives). In addition they provide the basis knowledge for the e-Learning modules. The infographics that have been developed up to now are the following.
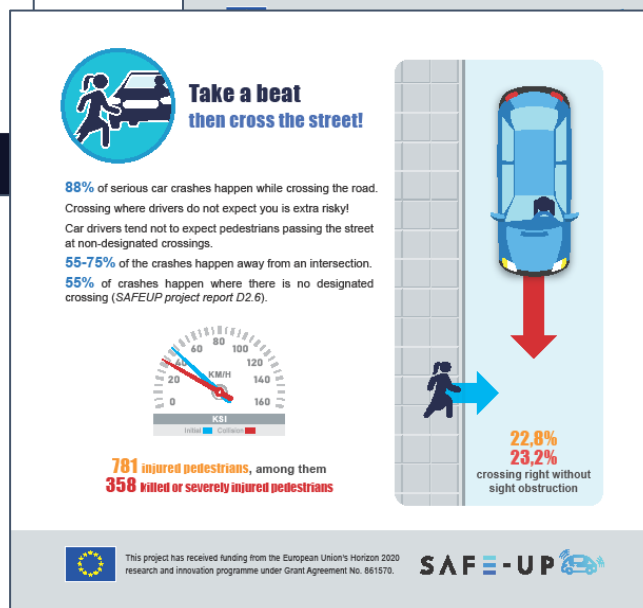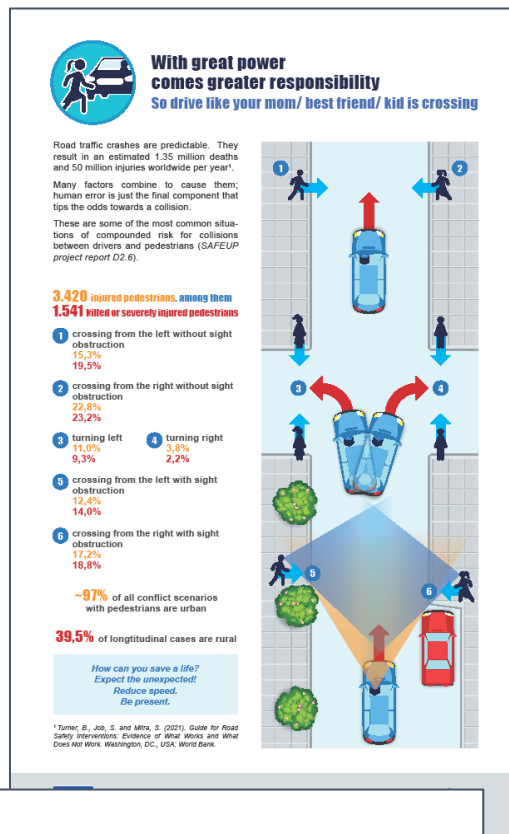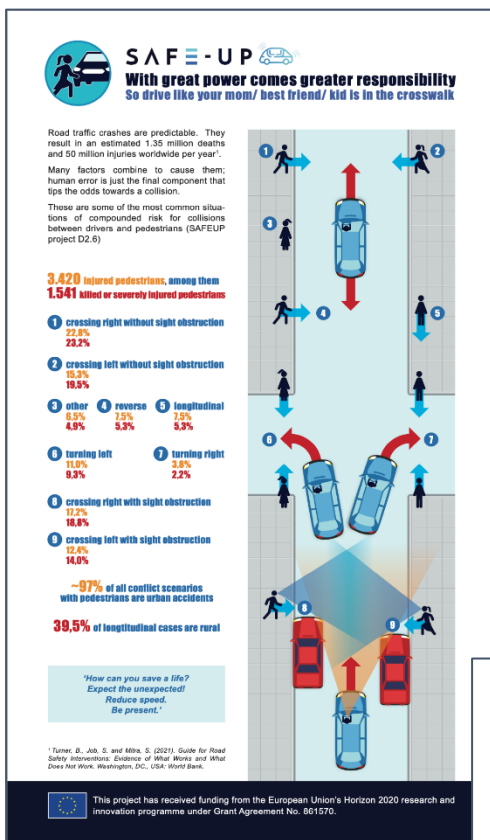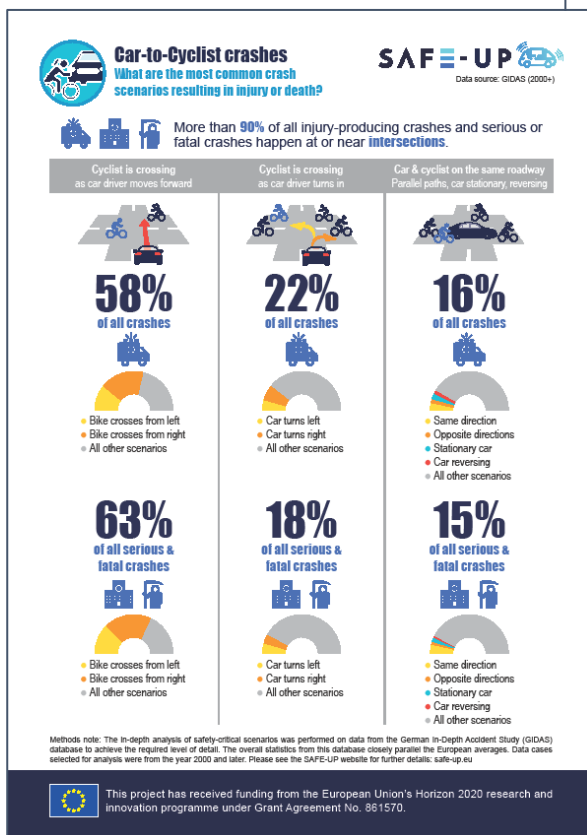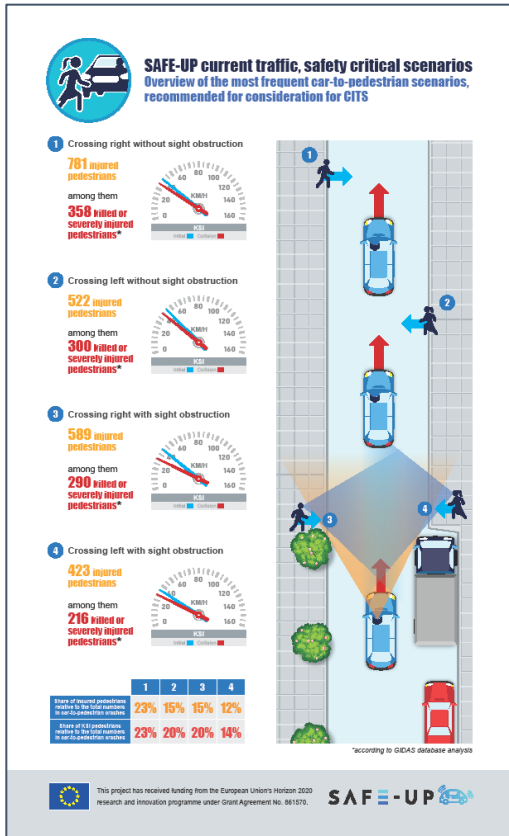
SAFE-UP

Car-to-Cyclist crashes in the EU (2018)
In relation to infrastructure & weather
Data source: CARE

The purpose of the study was to determine from existing crash data where to best place safety technology in infrastructure to reduce crashes. Police reported injury-producing and fatal cases for the year of 2018 were analysed to determine the relationship between pedestrian crossing location and frequency and severity of crashes. Cases that occurred in bad weather conditions (rain, snow, fog) were assessed separately for possible effect of poor visibility on crash occurrence.

85,640 all injuries
12,334 killed or seriously injured (KSI)
501 fatal
98,475 Total

4,906 all injuries
909 killed or seriously injured (KSI)
55 fatal
15,096 Total

Crossing away from junctions
Crossing away from junctions (bad weather conditions)
Crossing close to junctions
Crossing close to junctions (bad weather conditions)

These EU-level statistics guide the scope for further in-depth analysis of crashes.

Data note: Statistics represent 2018 data from countries belonging to the EU in 2021 (UK not included). See the SAFE-UP.EU for more information and full technical reports.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 861570.

Car-to-Pedestrian crashes in the EU (2018)
In relation to infrastructure & weather
Data source: CARE

The purpose of the study was to determine from existing crash data where to best place safety technology in infrastructure to reduce crashes. Police reported injury-producing and fatal cases for the year of 2018 were analysed to determine the relationship between pedestrian crossing location and frequency and severity of crashes. Cases that occurred in bad weather conditions (rain, snow, fog) were assessed separately for possible effect of poor visibility on crash occurrence.

83,490 all injuries
18,022 killed or seriously injured (KSI)
2,140 fatal
103,652 Total

11,895 all injuries
2,791 killed or seriously injured (KSI)
410 fatal
15,096 Total

Crossing away from junctions
Crossing away from junctions (bad weather conditions)
Crossing close to junctions
Crossing close to junctions (bad weather conditions)

These EU-level statistics guide the scope for further in-depth analysis of crashes.

Data note: Statistics represent 2018 data from countries belonging to the EU in 2021 (UK not included). See the SAFE-UP.EU for more information and full technical reports.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 861570.

Car-to-Pedestrian crashes
What are the most common crash scenarios resulting in injury or death?
Data source: GIDAS (2000+)

83% of all injury-producing crashes and 88% of serious or fatal crashes happen while crossing the road.

Crossing with no sight obstruction car driver is moving forward	Crossing at a sight obstruction car driver is moving forward	Crossing street as car driver turns in
38% of all crashes	**30%** of all crashes	**15%** of all crashes
Ped crosses from left / Ped crosses from right / All other scenarios	Ped crosses from left / Ped crosses from right / All other scenarios	Car turns left / Car turns right / All other scenarios
43% of all serious & fatal crashes	**33%** of all serious & fatal crashes	**12%** of all serious & fatal crashes
Ped crosses from left / Ped crosses from right / All other scenarios	Ped crosses from left / Ped crosses from right / All other scenarios	Car turns left / Car turns right / All other scenarios

Methods note: The in-depth analysis of safety-critical scenarios was performed on data from the German In-Depth Accident Study (GIDAS) database to achieve the required level of detail. The overall statistics from this database closely parallel the European averages. Data cases selected for analysis were from the year 2000 and later. Please see the SAFE-UP website for further details: safe-up.eu
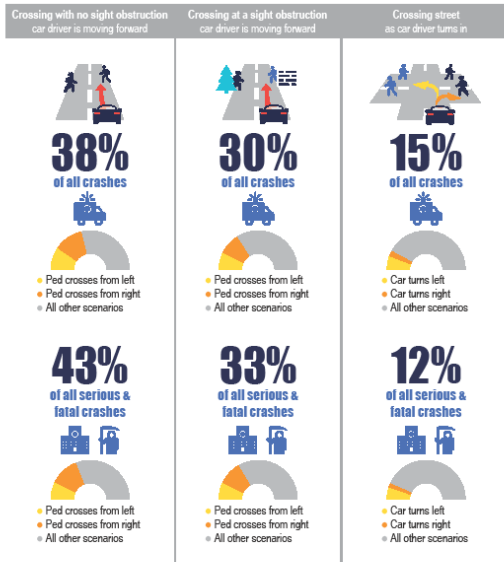
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 861570.

Car-to-Motorcyclist (MC) crashes
What are the most common crash scenarios involving large motorcycles?
Data source: GIDAS (2000+)

85% of injury-producing crashes happen in urban areas
30% of serious or fatal oncoming crashes happen in rural areas

Car & MC on crossing roadways	Car & MC on the same roadway Car driver turns into crossing road	Car & MC on the same roadway Parallel paths
34% of all crashes	**21%** of all crashes	**36%** of all crashes
MC comes from from left / MC comes from from right / All other scenarios	Car turns left / Car turns right / All other scenarios	MC ahead / MC oncoming / MC beside / MC behind / All other scenarios
34% of all serious & fatal crashes	**25%** of all serious & fatal crashes	**33%** of all serious & fatal crashes
MC comes from from left / MC comes from from right / All other scenarios	Car turns left / Car turns right / All other scenarios	MC ahead / MC oncoming / MC beside / MC behind / All other scenarios

Methods note: The in-depth analysis of safety-critical scenarios was performed on data from the German In-Depth Accident Study (GIDAS) database to achieve the required level of detail. The overall statistics from this database closely parallel the European averages. Data cases selected for analysis were from the year 2000 and later. Please see the SAFE-UP website for further details: safe-up.eu
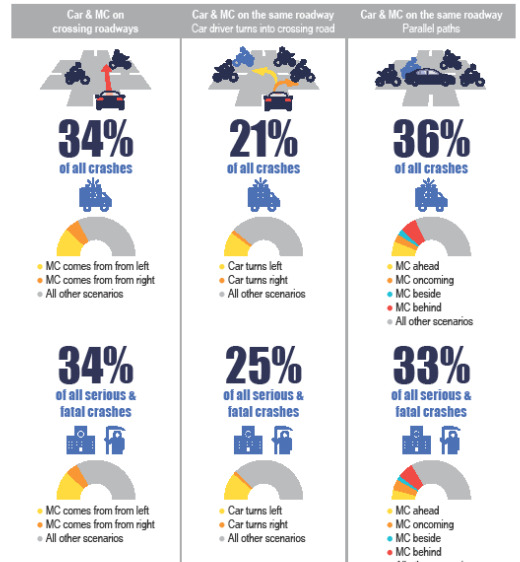
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 861570.

4.2.2 Summaries of project technical descriptions

Additionally, details from the project descriptions on the website have been used for training content on SAFE-UP innovations:

- descriptions of demos and figures (available at: https://www.safe-up.eu/demonstrators)

- the SAFE-UP's Demo 3 Integration week at BOSCH (available at: https://www.safe-up.eu/news/demo-3-integration-week-bosch)

4.2.3 Summaries of external research

Plain language summary: "Communication between automated vehicles and vulnerable road users in future traffic" (available at: https://www.safe-up.eu/news/communication-between-automated-vehicles-and-vulnerable-road-users-in-future-traffic)

4.2.4 Videos

Videos produced for SAFE-UP technical work packages will also be used in training modules and accessible through the online Safety Media Library as stand-alone items. The videos are either already online on SAFE-UPs website or uploaded on our common working server for the use of the Consortium.

4.3 e-Learning courses

4.3.1 Introduction

The SAFE-UP TE&A materials are developed from the target safety themes that were defined in D6.1 (see Table 1). All the courses developed in the framework of this Task have also been translated in 5 languages.

1. English
2. Spanish
3. German
4. Italian
5. Greek

4.3.2 e-Learning platform

The platform used to develop the SAFE-UP e-Learning courses is the Moodle 4.0. Moodle is an open-source learning management system that is used as a toolbox in many organizations, in every field of education, around the world and in almost every language.

More than one hundred and seventy thousand websites use Moodle for over forty million online courses serving three hundred million users worldwide [15]. Thus, Moodle is a globally proven and trusted software tool for developing learning environments to facilitate online teaching and learning experiences.

Moodle is one of the top learning management systems because it equips teachers and trainers with many easy-to-use tools to create customized learning platforms. Moodle is more flexible and feature-rich, going beyond the basic content capabilities of most LMSs. It provides many activities which support good educational practice and require students to actively engage with learning content and communicate and collaborate with each other in a variety of ways [15][16].

As an open-source Learning Management Systems (LMS), it is fully customizable to any user needs. Educational developers can create plugins for integrating external applications such as "Zoom Meeting" and the "Global Chat" thereby increasing Moodle's functionalities. Moodle's open-source mandate means it is always kept up-to-date through continuous revisions and improvements to match the current and evolving needs of its users.

More specifically, course creators or teachers that use Moodle to create their online courses can:

- present lessons in interesting and engaging ways
- assign tasks to attendees and assess their progress
- conduct synchronized conversations with attendees
- design and ask attendees multiple-choice, true-false, or short-answer questions
- add and update educational material
- could learners set their own study groups to create live online sessions? i.e. go through activities together?

Additionally, Moodle is scalable, secure, and easy to use anytime, anywhere, on any device. It can scale to support the needs of independent learners, small classes and large organizations, while all users (course creators, teachers, attendees etc.) are protected from unauthorized access, data loss and misuse. Moodle's development practices include security by design and can easily be deployed on a private secure cloud or server giving the user full control over their data to meet local legal requirements, including GDPR compliance. Finally, Moodle is web-based and so can be accessed from anywhere in the world. With a default mobile-compatible interface and cross-browser compatibility, content on the Moodle platform is easily accessible and consistent across different web browsers and devices [15].

4.3.3 Safety Theme: Safety Critical Scenarios

To address this theme, several e-Learning courses have been created to address the safety concerns of unprotected mobility modes, namely the walking, the cycling and the

motorcycling. In order to be aligned with Vision Zero philosophy and Safe Systems approach for shared responsibility of road safety across the transport system sectors, we attempt to avoid falling back on traditional, individual-centred or victim-blaming approaches which focus intervention efforts on rules, punishment and education to adapt humans to unsafe conditions. Recognizing that transport systems are currently in a state of updating and redesign to remove and reduce danger to unprotected road users, we take a multiple-user point of view in examining how crashes happen and the role of human error as it interacts with various aspects of the system, that is, not just other road users but also danger conditions present in infrastructure and vehicle design. We follow the philosophy that providing road users with evidence-based knowledge on the predictability and preventability of crashes can build capacity for individuals to make better, safer choices. A key tactic is to present crash information from multiple user points of view, for each road user to better understand the needs and common failings – and how these relate to vehicle limitations and infrastructure configurations – when using each transportation mode.

By introducing knowledge users to the SAFE-UP demos, the intention is for learners to understand their functionalities and limitations, linking this to how that they are expected impact URU safety in application to specific safety-critical scenarios. Since these e-Learning courses are targeting the main public (drivers, URUs, educators, etc.) technical detail on the demos will be limited. The safety innovations presented in the demos are in greater technical detail in a dedicated e-Learning course (see Section 4.3.4).

4.3.3.1   Training for drivers and pedestrians

The content of this course is based upon the goals for the project theme, Safety Critical Scenarios, identified in learning objectives (LOb) and described as the specific learning outcomes (LO) that learners should be able to understand and do by the end of a course. Each learning outcome has been coded according to the specific kind of knowledge and level of cognitive processing required, using Bloom's revised taxonomy for defining educational objectives. This coding supports the determination of teaching and learning activities that will engage these processes, thus informing design of the TE&A strategies developed for the courses are proposed. The table that follows presents this mapping.

Table 3: Training for drivers and pedestrians LOut, knowledge type, level of cognitive process and TE&A strategies

Goal	Specific Learning Outcomes	Knowledge Type	Level of Cognitive Process	TE&A strategies included in e-Learning course
1. Risk avoidance **Relate to LOb1, LOb2,**	**1.1 Understand** the current SCSs for drivers and pedestrians	Factual	Remember Understand	INFOGRA-PHICS TIP SHEETS
	1.2 Explain the characteristics of risk-taking	Conceptual	Understand	FACTS

Goal	Specific Learning Outcomes	Knowledge Type	Level of Cognitive Process	TE&A strategies included in e-Learning course
LOb6, LOb7, LOb8	• What is risk • Judging risk in various situations (SCS)			SELF-ANSWERED QUESTIONS
	1.3 Remember how risk perception is affected by personal factors • mental factors • role of self-control • perception of other drivers and pedestrians	Factual	Remember	VIDEOS QUESTIONS/ QUIZ
	1.4 Understand realistic risk perception in driving behaviours • accurate risk perception • quick and effective reaction times • proactive versus reactive riding actions • expectations of other road users	Conceptual	Understand	VIDEOS IMAGES MPOV
2. Social Responsibility **Relate to LOb1, LOb2, LOb6, LOb7, LOb9**	**2.1 Understand** the factors that make driving a lifelong learning process	Conceptual	Understand	TIP SHEETS
	2.2 Understand of the complexity of the driving task	Conceptual	Understand	VIDEOS
	2.3 Understand how to share the road safely	Conceptual	Understand	IMAGES MPOV
	2.4 Understand the appropriate communication with other road users	Conceptual	Understand	IMAGES MPOV TIP SHEETS
	2.5 Understand environmental concerns in SCS	Factual	Understand	INFOGRAPHICS
3. Safe on the roads	**3.1 Understand** the driving skills that minimize risks.	Conceptual	Understand	TIP SHEETS VIDEOS

Goal	Specific Learning Outcomes	Knowledge Type	Level of Cognitive Process	TE&A strategies included in e-Learning course
Relate to LOb3, LOb9.				
	3.2 Understand what technologies is SAFE-UP developing and which traffic safety conditions they will assist.	Factual	Understand	IMAGES TIP SHEETS

The e-Learning course that has been sketched to cover all the aforementioned Specific Learning Outcomes is available at SAFE-UPs website, here https://www.safe-up.eu/resources, and its detailed structure is presented at the following table.   The storyboards on which the e-Learning course have been based upon are presented in Appendix A. The e-Learning course has been developed within the framework of Task 6.2 and will be tested using the methodology to be developed in T6.4. Any updates that might occur will be reported in the last deliverable of this WP, namely D6.5 "Knowledge Translation, outreach, safety awareness update".

Table 4: e-Learning course 1: Drivers and pedestrians safety on the road contents and description

SAFE-UP e-Learning course 1: Drivers and pedestrians safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and pedestrians understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.		
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**

1	**Safety critical situations among drivers and pedestrians**	**In this Section when driving and when walking you will…**
		• **Be informed about the current Safety Critical Scenarios for drivers and pedestrians**
		• **Understand the most common collision situations and characteristics**
		• **Create enhances perception and anticipation of risks associated with existing traffic patterns**
		• **Develop respectful and responsible attitudes towards road safety**
		• **Understand the characteristics of risk-taking**
		    • **What is risk**
		    • **Judging risk in various situations (SCS)**
			1.1
			1.2
			1.3
				27

1.1	Introduction to risk and crashes	What are risks and what are emergency situations What is the difference between accidents and road traffic crashes and which term we should use	1.2 1.3	12 min

SAFE-UP

SAFE-UP e-Learning course 1: Drivers and pedestrians safety on the road. Time: [114 min]		The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and pedestrians understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.		
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**
1.2	Car-to-Pedestrian crashes facts	Present and describe the numbers of accidents per mode, as well as the most common crash crashes among cars and pedestrians based on SAFE-UP outcomes. Make the users think how they feel is the presented situations already. Present the most common collision situations and their characteristics.	1.1	15 min

2	**Sharing the road safely - Drivers**	**In this Section when driving you will…**
		 • **Understand why one needs to be a thinking driver**
		 • **Be trained to make good decisions**
		  • **keep learning**
		  • **plan the driving task**
		  • **predict the scene**
		 • **Develop respectful and responsible attitudes towards driving which contribute to community safety**
		 • **Create correct risk perception**
		 • **Create correct risk assessment strategies**
		 • **Understand how to share the road safely**
		 • **Evaluate how risk perception is affected by personal factors**
		In this Section when walking you will…
			1.3
			1.4
			2.1
			2.2
			2.3
			2.4
			2.5
			3.1
				50 min

SAFE-UP e-Learning course 1: Drivers and pedestrians safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and pedestrians understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.		

Section number	Title	Description	Learning outcome number	Est. time (minutes)

		• **Understand that driving is a really challenging task that needs respect and lifelong learning.**
		• **Be trained to make good decisions**
		  • **keep learning**
		  • **predict the scene**
		• **Take responsibility as a pedestrian**
		• **Create correct hazard perception**
		• **Create correct risk assessment strategies**
		• **Understand how to share the road safely**		

2.1	Perceptions of safety critical scenarios from the different points of view of driving and walking	How the driver and the pedestrian perceive the same situation. The same road traffic situation is presented from the point of view of the driver and from the point of view of the pedestrian at the same time.	1.4 2.3 2.4	5 min
2.2	The importance of speed	How speed affects the likelihood and the severity of a crash. How speed increases the stopping distance of a vehicle.	1.4 3.1 3.2	12 min

SAFE-UP e-Learning course 1: Drivers and pedestrians safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and pedestrians understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.			
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**
2.3	Environment conditions	How different environmental conditions like low visibility and poor weather conditions alter how we perceive a road traffic situation and what are the differences from the same typical situation. Strategies for driving safely in challenging environmental conditions.	1.3 1.4 2.2 2.5	10 min
2.3	Personal factors	How important it is to be rest and prepare to drive, especially for long distance trips. How distractions affect driving tasks and ways to avoid it – mindfulness while driving	1.3 1.4 2.2 3.1	20 min
2.5	Lifelong learning	Understand and appreciate that driving is a lifelong learning process. Understanding what it means to be fit to drive.	2.1	3 min

SAFE-UP e-Learning course 1: Drivers and pedestrians safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and pedestrians understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.		
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**
3	**Sharing the road safely - Pedestrians**	**In this Section when driving you will…** • **Understand how walking is a challenging task, pedestrians are people like all of us and they may make mistakes.** • **Understand why one needs to be a thinking driver** • **Be trained to make good decisions** • **Develop respectful and responsible attitudes towards driving which contribute to community safety** • **Create correct hazard perception** • **Create correct risk assessment strategies** • **Understand how to share the road safely** • **Develop appropriate communication with other road users** • **Familisarise with appropriate driving actions to minimize risk.** **In this Section when walking you will…** • **Understand how walking is a challenging task, pedestrians are people like all of us and they may make mistakes.** • **Develop respectful and responsible attitudes towards walking which contribute to community safety** • **Be trained to make good decisions** • **Take responsibility as a pedestrian** • **Create correct hazard perception**	1.1 1.3 1.4 2.3 2.4	22 min

SAFE-UP e-Learning course 1: Drivers and pedestrians safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and pedestrians understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.

Section number	Title	Description	Learning outcome number	Est. time (minutes)
		• **Create correct risk assessment strategies** • **Understand how to share the road safely** • **Develop appropriate communication with other road users** • **Evaluate how risk perception is affected by environmental and/ or personal factors**		
3.1	Walking facts and benefits	We are all pedestrians: facts regarding walking and road traffic accidents that related to pedestrians Benefits of walking	1.1 1.5	4 min
3.2	Visions zero	Human beings are vulnerable and yes, we make mistakes In road traffic crashes loss of life and serious injuries are **NOT acceptable** **NOR inevitable** Tip on how to interact with other road users	2.3 2.4	10 min
3.3	Environment conditions	How different environmental conditions like low visibility and poor weather conditions alter how we perceive a road traffic situation and what are the differences from the same typical situation.	1.3 1.4	2 min

SAFE-UP

SAFE-UP e-Learning course 1: Drivers and pedestrians safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and pedestrians understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.

Section number	Title	Description	Learning outcome number	Est. time (minutes)
		How should we act when walking under such conditions.	2.4	
3.4	Personal factors -	How dangerous it is to be distracted while walking. What are the risks and what are the benefits of mindful walking and driving and how can this be achieved.	1.3 1.4 2.4	6 min
4	**Sharing the road safely – SAFE-UP technologies**	**In this Section you will** • **Understand the safety benefit of a "safety system" where the behavioral aspect tackled at the aforementioned Sections is coupled with technological advances that enhance safety in a holistic form.** • **Familiarise with the upcoming technological trends that will be part of mixed traffic.** • **See the SAFE-UP demos and understand how they are addressing specific road traffic problems of today.**	**3.2**	**15 min**
4.1	Introduction: Safety System Approach	Understand the safety benefit of a safety system where the behavioral aspect tackled at the aforementioned Sections is coupled with technological advances that enhance safety in a holistic form.	3.2	3 min

SAFE-UP e-Learning course 1: Drivers and pedestrians safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and pedestrians understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.		

Section number	Title	Description	Learning outcome number	Est. time (minutes)
4.2	Demo 1	Familiarize with the SAFE-UP **Occupant monitoring and restraining systems**	3.2	3 min
4.3	Demo 2	Familiarize with the SAFE-UP **Improved VRU detection under bad weather conditions**	3.2	3 min
4.4	Demo 3	Familiarize with the SAFE-UP **Advanced intervention functions**	3.2	3 min
4.5	Demo 4	Familiarize with the SAFE-UP **Enhanced VRU safety system**	3.2	3 min

4.3.3.2 Training for drivers and bicyclists

The content of this course is based upon the goals for the project theme, Safety Critical Scenarios (SCS), identified in learning objectives (LOb) and described as the specific learning outcomes (LO) that learners should be able to understand and do by the end of a course. Each learning outcome has been coded according to the specific kind of knowledge and level of cognitive processing required, using Bloom's revised taxonomy for defining educational objectives. This coding supports the determination of teaching and learning activities that will engage these processes, thus informing design of the TE&A strategies developed for the courses are proposed. The table that follows presents this mapping.

Table 5: Training for drivers and bicyclists LO, knowledge type, level of cognitive process and TE&A strategies

Goal	Specific Learning Outcomes	Knowledge Dimension	Cognitive Process Dimension	TE&A strategies included in E-Learning course
1. Risk avoidance **Relate to LOb1, LOb2, LOb6, LOb7, LOb8**	**1.1 Understand** the current SCSs for drivers and pedestrians	Factual	Remember Understand	INFOGRA-PHICS TIP SHEETS
	1.2 Explain the characteristics of risk-taking • What is risk • Judging risk in various situations (SCS)	Conceptual	Understand	FACTS SELF-ANSWERED QUESTIONS
	1.3 Remember how risk perception is affected by personal factors • mental factors • role of self-control • perception of other drivers and pedestrians	Factual	Remember	VIDEOS QUESTIONS/ QUIZ

Goal	Specific Learning Outcomes	Knowledge Dimension	Cognitive Process Dimension	TE&A strategies included in E-Learning course
	1.4 Understand realistic risk perception in driving behaviours • accurate risk perception • quick and effective reaction times • proactive versus reactive riding actions • expectations of other road users	Conceptual	Understand	VIDEOS IMAGES MPOV
2. Social Responsibility **Relate to LOb1, LOb2, LOb6, LOb7, LOb9**	**2.1 Understand** the factors that make driving a lifelong learning process	Conceptual	Understand	TIP SHEETS
	2.2 Understand the complexity of the driving task	Conceptual	Apply	VIDEOS
	2.3 Understand how to share the road safely	Conceptual	Understand	IMAGES MPOV
	2.4 Understand the appropriate communication with other road users	Conceptual	Understand	IMAGES MPOV TIP SHEETS
	2.5 Understand environmental concerns in SCS	Factual	Understand	INFOGRAPHICS
3. Safe on the roads **Relate to LOb3, LOb9.**	**3.1 Understand** the driving skills that minimize risks.	Conceptual	Understand	TIP SHEETS VIDEOS
	3.2 Understand what technologies is SAFE-UP developing and which traffic safety conditions they will assist.	Factual	Understand	IMAGES TIP SHEETS

The e-Learning course that has been sketched to cover all the aforementioned Specific Learning Outcomes is available at SAFE-UPs website, here https://www.safe-up.eu/resources, and its detailed structure is presented at the following table. The

storyboards on which the e-Learning course have been based upon are presented in Appendix B. The e-Learning course has been developed within the framework of Task 6.2 and will be tested using the methodology to be developed in T6.4. Any updates that might occur will be reported in the last deliverable of this WP, namely D6.5 "Knowledge Translation, outreach, safety awareness update".

Table 6: e-Learning course 2: Drivers' and bicyclists' safety on the road contents and description

SAFE-UP e-Learning course 2: Drivers and cyclists safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and bicyclists understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.

Section number	Title	Description	Learning outcome number	Est. time (minutes)

1	**Safety critical situations among drivers and cyclists**	**In this Section when driving and when cycling you will…**
		• **Be informed about the current Safety Critical Scenarios for drivers and cyclists**
		• **Understand the most common collision situations and characteristics**
		• **Create enhances perception and anticipation of risks associated with existing traffic patterns**
		• **Develop respectful and responsible attitudes towards road safety**
		• **Understand the characteristics of risk-taking**
		   • **What is risk**
		   • **Judging risk in various situations (SCS)**
			1.1
			1.2
			1.3
				27

1.1	Introduction to risk and crashes	What are the risks and what are the emergency situations? What is the difference between accidents and road traffic crashes and which term we should use?	1.2 1.3	12 min

SAFE-UP

SAFE-UP e-Learning course 2: Drivers and cyclists safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and bicyclists understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.

Section number	Title	Description	Learning outcome number	Est. time (minutes)
1.2	Car-to-Cyclists crashes facts	Present and describe the numbers of accidents per mode, as well as the most common crash crashes among cars and cyclists based on SAFE-UP outcomes. Make the users think how they feel is the presented situations already. Present the most common collision situations and their characteristics.	1.1	15 min

2	**Sharing the road safely - Drivers**	**In this Section when driving you will…**
		• **Understand why one needs to be a thinking driver**
		• **Be trained to make good decisions**
		   • **keep learning**
		   • **plan the driving task**
		   • **predict the scene**
		• **Develop respectful and responsible attitudes towards driving which contribute to community safety**
		• **Create correct risk perception**
		• **Create correct risk assessment strategies**
		• **Understand how to share the road safely**
		• **Evaluate how risk perception is affected by personal factors**
			1.3
			1.4
			2.1
			2.2
			2.3
			2.4
			2.5
			3.1
				50 min

SAFE-UP

SAFE-UP e-Learning course 2: Drivers and cyclists safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and bicyclists understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.

Section number	Title	Description	Learning outcome number	Est. time (minutes)

		In this Section when cycling you will…
		• **Understand that driving is a really challenging task that needs respect and lifelong learning.**
		• **Be trained to make good decisions**
		  • **keep learning**
		  • **predict the scene**
		• **Take responsibility as a cyclist**
		• **Create correct hazard perception**
		• **Create correct risk assessment strategies**
		• **Understand how to share the road safely**		

2.1	Different perceptions of potential safety critical situations from driving and walking and cycling POVs.	How the driver and the cyclists perceive the same situation.	1.4 2.3 2.4	5 min

SAFE-UP

SAFE-UP e-Learning course 2: Drivers and cyclists safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and bicyclists understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.

Section number	Title	Description	Learning outcome number	Est. time (minutes)
2.2	The importance of speed	How speed affects the likelihood and the severity of a crash. How speed increases the stop distance of a vehicle.	1.4 3.1 3.2	12 min
2.3	Environment conditions	How different environmental conditions like low visibility and poor weather conditions alter how we perceive a road traffic situation and what are the differences from the same typical situation. How should we act when walking under such conditions.	1.3 1.4 2.2 2.5	10 min
2.3	Personal factors	How important it is to be rested and prepare to drive, especially for long distance trips. How distractions affect driving tasks and ways to avoid it – mindfulness while driving.	1.3 1.4 2.2 3.1	20 min

S A F E - U P

SAFE-UP e-Learning course 2: Drivers and cyclists safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and bicyclists understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.		
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**
2.5	Lifelong learning	Understand and appreciate that driving is a lifelong learning process. Understanding what it means to be fit to drive.	2.1	3 min
3	**Sharing the road safely - cyclists**	**In this Section when driving you will…** • **Understand how challenging the cycling a task is. Many different people cycle and anyone may make a mistake. Cyclists may need to make sudden maneuvers to avoid hazards.** • **Understand why one needs to be a thinking driver to share the road safely** • **Understanding the specific risks to cyclists to help make good decisions to keep self and others safe** • **Develop respectful and responsible attitudes towards other road users when driving, to contribute to community safety** • **Analyze traffic for known high risk patterns and scenarios affecting cyclists** • **Create your own hazard perception strategies and share with friends and family**	**1.1** **1.3** **1.4** **2.3** **2.4**	**22 min**

SAFE-UP

SAFE-UP e-Learning course 2: Drivers and cyclists safety on the road. Time: [114 min]	The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and bicyclists understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.		
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**
		• **Apply correct risk assessment strategies** • **Develop appropriate communication with other road users** • **Familiarise with appropriate driving actions to minimize risk.** **In this Section when cycling you will…** • **Understand how cycling is a challenging task, cyclists are people like all of us and they may make mistakes.** • **Develop respectful and responsible attitudes towards cycling which contribute to community safety** • **Be trained to make good decisions** • **Take responsibility as a cyclists** • **Create correct hazard perception** • **Create correct risk assessment strategies** • **Understand how to share the road safely** • **Develop appropriate communication with other road users** • **Evaluate how risk perception is affected by environmental factors**		

SAFE-UP e-Learning course 2: Drivers and cyclists safety on the road.

Time: [114 min]

The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and bicyclists understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.

Section number	Title	Description	Learning outcome number	Est. time (minutes)
3.1	Cycling facts and benefits	Facts regarding cycling and road traffic accidents that related to cyclists. Benefits of cycling.	1.1 1.5	4 min
3.2	Be prepared to cycle with safety	Tip on how to interact with other road users.	2.3 2.4	20 min
3.3	Environment conditions	How different environmental conditions like low visibility and poor weather conditions alter how we perceive a road traffic situation and what are the differences from the same typical situation. How should we act when walking under such conditions.	1.3 1.4 2.4	2 min
4	**Sharing the road safely – SAFE-UP technologies**	**In this Section you will** • **Understand the safety benefit of a "safety system" where the behavioral aspect tackled at the aforementioned Sections is coupled with technological advances that enhance safety in a holistic form.**	**3.2**	**15 min**

Section number	Title	Description	Learning outcome number	Est. time (minutes)
— SAFE-UP e-Learning course 2: Drivers and cyclists safety on the road. Time: [114 min]		The aim of this course is to present to all road users, the identified and predictable critical situations that endanger people outside of vehicles, and help all drivers and bicyclists understand when and why these situations occur, how they can be avoided through tips and exercises on hazard perception. By encouraging better understanding of each other's perspectives and common errors on both sides leading to crashes, the course aims to promote better decision making through new knowledge of specific risks and enhanced sense of shared responsibility for safety. Also, the technologies that are developed in SAFE-UP will assist on creating a more safe road environment for all. Thoese technologies are presented here.		
		• **Familiarise with the upcoming technological trends that will be part of mixed traffic.** **See the SAFE-UP demos and understand how they are addressing specific road traffic problems of today.**		
4.1	Introduction: Safety System Approach	Understand the safety benefit of a safety system where the behavioral aspect tackled at the aforementioned Sections is coupled with technological advances that enhance safety in a holistic form.	3.2	3 min
4.2	Demo 1	Familiarize with the SAFE-UP **Occupant monitoring and restraining systems**	3.2	3 min
4.3	Demo 2	Familiarize with the SAFE-UP **Improved VRU detection under bad weather conditions**	3.2	3 min
4.4	Demo 3	Familiarize with the SAFE-UP **Advanced intervention functions**	3.2	3 min
4.5	Demo 4	Familiarize with the SAFE-UP **Enhanced VRU safety system**	3.2	3 min

4.3.3.3 Training for drivers and PTW riders

The content of this course is based upon the goals for the project theme, Safety Critical Scenarios, identified in learning objectives (LOb) and described as the specific learning outcomes (LO) that learners should be able to understand and do by the end of a course. Each learning outcome has been coded according to the specific kind of knowledge and level of cognitive processing required, using Bloom's revised taxonomy for defining educational objectives. This coding supports the determination of teaching and learning activities that will engage these processes, thus informing design of the TE&A strategies developed for the courses are proposed. The table that follows presents this mapping.

Table 7: Training for drivers and PTW riders LO, knowledge type, level of cognitive process and TE&A strategies

Goal	Specific Learning Outcomes	Knowledge Type	Level of Cognitive Process	TE&A strategies included in E-Learning course
1. Risk avoidance **Relate to LOb1, LOb2, LOb6, LOb7, LOb8**	**1.1 Describe** the hazards of riding.	Factual	Remember Understand Evaluate	INFOGRAPHICS TIP SHEETS
	1.2 Explain the characteristics of risk-taking • What is risk • Judging risk in various situations (SCS)	Conceptual	Understand	SUMMARY INFOGRAPHICS
	1.3 Evaluate how risk perception is affected by personal factors • mental factors • physical factors • role of self-control • perception of other drivers and pedestrians	Metacognitive	Evaluate	SELF CHECK EXERCISES
	1.4 Assess personal risk tolerance. • thinking for oneself • role of self-control • role of under/over-confidence • identifying personal limits and abilities	Conceptual Procedural Metacognitive	Evaluate Create	INFO SHEETS SYNTHESES
	1.5 Explain (and demonstrate) the	Conceptual Procedural	Understand Apply	Safety-critical scenarios

Goal	Specific Learning Outcomes	Knowledge Type	Level of Cognitive Process	TE&A strategies included in E-Learning course
	application of risk management to riding behaviors. a. accurate risk perception b. quick and effective reaction times b. Understand limits of reaction time c. proactive versus reactive riding actions d. expectations ~~of~~ from/towards other road users e. consequences of not doing what other road users expect f. safe time margins to complete riding manoeuvres New: g. Risks associated w/ sharing road w/ AVs Learning to use onboard safety systems			• Info sheets • Syntheses • Active learning on SCS, user failures • Videos of crash reconstructions + learning activities Psychology • (a) Tip sheet on risk perception/evaluation • (b, c, f) Rxn T active learning module Questions on plans to use the knowledge
	1.6 Describe the most common and serious collision scenarios for motorcyclists **Explain** how specific scenario characteristics and additional factors contribute to crash risk.	Conceptual	Remember Understand	INFOGRAPHICS VIDEOS
	1.7 Evaluate and **explain** local norms in traffic participation behaviours as they relate to risk taking.	Conceptual	Evaluate Create	DISCUSSION
2. Rider Responsibility	**2.1 Evaluate** how positive and negative personal factors influence riding attitudes	Conceptual	Evaluate Create	TIP SHEETS QUESTIONS

Goal	Specific Learning Outcomes	Knowledge Type	Level of Cognitive Process	TE&A strategies included in E-Learning course
Relate to LOb1, LOb2, LOb6, LOb7, LOb9	**2.2 Explain** how positive and negative social factors influence riding attitudes and attitudes towards riders.	Conceptual	Evaluate Create	TIP SHEETS
	2.3 Describe riding behaviours that reflect safe, healthy and courteous riding attitudes.	Conceptual Metacognitive	Apply	TIP SHEETS
	2.4 Explain theories on risk perception, risk-taking.	Conceptual	Understand	TIP SHEETS
3. SOCIAL RESPONSIBILITIES **Relate to LOb1, LOb2, LOb6, LOb7, LOb9**	**3.1 Explain** how to share the road safely.	Conceptual	Understand	TIP SHEETS
	3.2 Describe how to share the road safely.	Conceptual	Remember	INFOGRAPHICS VIDEOS
	3.3 Demonstrate appropriate communication with other road users.	Metacognitive	Understand	FIGURES VIDEOS
	3.3 Assess the role of communication failures in crash causation.	Procedural Conceptual	Apply Evaluate	VIDEOS TIP SHEETS
	3.4 Explain the concept of shared responsibility according to the safe system approach.	Conceptual	Evaluate	FACTS & FIGURES TIP SHEETS
	3.5 Explain the concept of shared responsibility according to the safe system approach.	Metacognitive	Create	INFOGRAPHICS VIDEOS
4. SAFE RIDING **Relate to LOb3, LOb9.**	**4.1 Explain** why/how implementing the SEE-THINK-DO approach can minimize known, predictable riding risks (and risks to riders – driver POV)	Conceptual	Evaluate	INFOGRAPHICS VIDEOS QUESTIONS TIP SHEET

Goal	Specific Learning Outcomes	Knowledge Type	Level of Cognitive Process	TE&A strategies included in E-Learning course
	• Defensive riding • Collision avoidance			
	4.2 Explain effective use OBSERVATION SKILLS to avoid known SCS • Knowing *where* to observe • Knowing *how* to observe	Procedural	Understand	FACTS ANIMATIONS
	4.3 Demonstrate attentiveness towards analyzing the riding/driving situation	Procedural	Apply	IMAGES TIP SHEETS
	4.4 Demonstrate/ explain appropriate **RIDING ACTIONS** to minimize risk.	Conceptual	Apply	VIDEOS
	4.5 Explain the competent & responsible use of safety technologies and relate to sharing the road safely. (Airbag clothing, CITS, onboard control electronics (ABS, etc.)	Conceptual Procedural	Understand Apply	INFOGRAPHICS TIP SHEETS
5. VEHICLE PERFORMANCE **Relate to LO9.**	**5.1 Explain** the forces of physics as they apply to riding.	Conceptual	Understand	FACTS & FIGURES
	5.2 Explain how hazardous riding situations relate to friction conditions.	Conceptual	Understand	FACTS & FIGURES
	5.3 Describe riding behaviours to compensate for hazardous riding conditions.	Conceptual Procedural	Apply	FACTS & FIGURES
	5.4 Describe how safety technologies compensate for rider/driver failures and hazardous conditions.	Factual Conceptual	Evaluate	FACTS & FIGURES

The e-Learning course that has been sketched to cover all the aforementioned Specific Learning Outcomes is under development and its detailed structure is presented at the

following table. The storyboards on which the e-Learning course have been based upon are presented in Appendix C. The e-Learning course conceptualized and sketched within the framework of Task 6.2. It will be developed within the framework of Task 6.3 and will be tested using the methodology to be developed in T6.4. The link of the e-Learning course will be available and reported in the last deliverable of this WP, namely D6.5 "Knowledge Translation, outreach, safety awareness update".

Table 8: e-Learning course 3: Drivers' and PTW Riders' safety on the road contents and description

Training for safer PTW riding Time/length:			KU(s): Pre- and post-licensees, drivers of PTWs & multitrack vehicles		
Unit number	Title		Description	Learning outcome Nos.	Est. time

1.1	Course introduction: overview, background and expectations		• Background, aims & motivation – SAFE-UP aims & outcomes, wrt Vision Zero & future traffic; key takeaways from WP2 Safety-Critical Scenarios
			• Who can use this course?
			• philosophy and approach, integrating principles from safe systems approach with a multiple user POV approach
			   o Learning goals, expectations
			• Motorcycling and society
			• Overview of the course
			   o Sections & content
			• how to use the course, what to get out of it
			• links to websites, videos & materials (e.g. ICBC materials)
				Goals addressed
				
				1, 2, 3, 5
					10 min

1.2	Data about you and consent
	
	Pre-course test/data collection
			• Information collected for evaluation of learners and course, and for research
			• [google form] Data collection on learner
			   o Demographic profile info
			   o personal factors [?]
			   o Before (/after) opinion data
			   o Consent to use personal & evaluative data
			• **Activity (questionnaires)**
			   o Personal risk self-assessment & risk tolerance?
			   o Opinions on usefulness of assistive technology, other?
				1.2, 1.4
				
				4.5
				
				5.4
					3 min

SAFE-UP

Training for safer PTW riding Time/length:	KU(s): Pre- and post-licensees, drivers of PTWs & multitrack vehicles			
Unit number	Title	Description	Learning outcome Nos.	Est. time
2.1	Deciding to ride (safe)	• Current **collision statistics** and known contributing factors in crashes, high risk groups • brief reference to **safe systems approach.** Why we are targeting riders & drivers together – shared responsibility, 6 pillars • Overview of the challenges and hazards that riders face • Overview of concepts and strategies of safe riding and solutions to risks	1.1, 1.2 1.5 3.4 4.1	13 min
3.1	Crashes are predictable Part 1 Most common traffic crash configurations & their characteristics	• Key concepts in road safety & crash research • Definitions (configuration, SCS, pre-crash phase vs during, avoidance vs mitigation, • Most common & serious crash configurations, SCS (Huertas, 2021)	1.1, 1.3, 1.4, 1.5 2.3 3.5 4	10 min

3.2	Crashes are predictable Part 2 The role of human error in crash causation	• Error types by configuration:
		  o Avoidable phase of SCS
		  o Unavoidable phase of SCS
		  o Emergency maneuver execution
		    ▪ Stats on execution errors – success rates and implications for training & technological interventions (Huertas, 2021)
		• Realistic reaction times, human limitations
			1.1, 1.4-1.6
			
			2.3
			
			3.3, 3.5
			
			4	

SAFE-UP

Training for safer PTW riding Time/length:	KU(s): Pre- and post-licensees, drivers of PTWs & multitrack vehicles			
Unit number	Title	Description	Learning outcome Nos.	Est. time

4	**Solutions for safer motorcycling**	• Overview of intervention types – what works (not just vehicle-based), what is coming
		• incl. *technology* (passive, active, connected), infrastructure design
		  ○ AVs & Potential future risks in AV traffic
		  ○ vehicle sensors
		  ○ Pre-crash braking and MAEB
		  ○ PPEs – for rider & bike (focus on current developments)
		  ○ C-ITS
		  ○ PTW: Current examples, developments, pros & cons of eg. head-up displays, info systems, warnings, blind spot deterction, etc. [see Ducati collab documents]
		  ○ Car: similar list to PTW – benefits and new threats for PTW safety
		• Compare car/MC **technological interventions**? Reasons for disparities?
		• SAFE-UP targets
		• Controversy around benefits of training, but consensus on developing thinking, self-reflective, socially responsible drivers and riders & drivers
		• Behavioral interaction w/ safety systems – increase cog load, increase in risky behaviour, violations
			1.1, 1.2, 1.7
			
			2.3
			
			3.1, 3.6
			
			4.5
				15 min

5	Motorcycling safely – essential knowledge, skills	• Introduction to ICBC'S See-think-do approach [links to driver handbooks] ○ Observation skills	1.1, 1.7	15 min

SAFE-UP

Training for safer PTW riding Time/length:	KU(s): Pre- and post-licensees, drivers of PTWs & multitrack vehicles			
Unit number	Title	Description	Learning outcome Nos.	Est. time

	& strategies to manage risk	o Hazard anticipation & perception
		o Assessing risk
		o Choosing solutions
		• Pre-critical - Avoidable phase of SCS
		• Critical - Unavoidable phase of SCS
		o Link to PPEs? Efforts & barriers to increasing uptake/use
		• Risk management actions
		• Emergency maneuver execution
		o Stats on execution errors – success rates and implications for training & technological interventions (Huertas, 2021)
		
		Activities:
		
		• **Self-tests of knowledge**
		• **Questions to stimulate...**
		  o **Recalling & identifying hazards and risk situations**
		  o **Applying observational skills**
		  o **Analyzing traffic situations**
		  o **Selection of riding actions appropriate to situations and risk assessments**
		• **Integration activities:**
		  o **Talk to an experienced motorcycle friend about hazard perception & avoidance**
		  o **Take a tour through your neighbourhood, identifying potential hazards and**
		  o **Go to a busy intersection and observe behaviours of riders and drivers and discuss in relation to risk management**
			3.4
			
			4.1-4.4	

Training for safer PTW riding Time/length:		KU(s): Pre- and post-licensees, drivers of PTWs & multitrack vehicles		
Unit number	Title	Description	Learning outcome Nos.	Est. time
		• **Downloadable infographics to support learning & analyses** o **Links to resources (ICBC manuals)**		

6	APPLYING YOUR SMART & SAFE RIDING PRINCIPLES	• **Analyze videos reconstructed from real crashes, using SEE-THINK-DO approach**
		• **Questions to guide and stimulate analyses**
		• **Check your how you did in your answers**
		• **Open-ended questions to**
		  o **Stimulate reflections on personal risk-taking**
		  o **stimulate application of knowledge & tools**
		  o **explore the interactions between (faulty) risk perception and willingness to take risks**
		  o **examine the relationship between risk reduction and courteous driving/riding (shared responsibility)**
		probe for usefulness & intended use of learning & materials
			1.3, 1.6-1.8
			2.3
			3.6
			4
			5
				10 min

7	Human error in the safe systems approach to road safety and Vision Zero	• Intro. to the Safe System paradigm, & Vision Zero philosophy, aims • Paradigm changes through history of road safety research • 6 pillars and the current paradigm shift: Human error, shared responsibility • How we have been careful in language used in Unit #3 – non-blaming, non -judgemental • Relate to how safety technologies are designed to compensate, mitigate	3.1-3.4	10 min

Training for safer PTW riding Time/length:		KU(s): Pre- and post-licensees, drivers of PTWs & multitrack vehicles		
Unit number	Title	Description	Learning outcome Nos.	Est. time
	[TO BE DONE IN T6.3 updated version]	• The role of new vehicle safety technologies, infrastructure – debate about technology vs. lower speeds, e.g.?		

8	Integrating your learning	• Pre-/Post-opinion survey on AVs and advanced safety systems (5.5M)
		• Go back and look at your answers on personal risk assessment & reflect, discuss with a friend
		• Contextualizing your knowledge in your own context:
		   o Which SCS are most pertinent in your neighbourhood? (1.8)
		   o What personal risk factors are most relevant in your social, peer group?
		• How will you manage your risk in riding/sharing the road with motorcycles?
			1.6-1.8
			
			2.1-2.4
			
			3.1-3.5
			
			4
			
			5
				7 min

4.3.4 Safety Topic: SAFE-UP demos

The safety theme of SAFE-UP innovative technologies has been already introduced within the theme of the SCS, to inform generally on how the SAFE-UP technologies will provide improved safety for people inside and outside of cars. Brief descriptions of the demonstrators for these technologies can be found in Section 4 of the two previous e-Learning courses.

In addition to the training mentioned previously, we have created a more technical e-Learning course regarding demos that is focusing more on researchers, Road transport & safety professionals, Private sector, industry, OEMs, Decision makers, policy makers and governments. More technical information are included here, since the demos are presented in a nutshell including information about their scope, technologies included and also the testing.

The content of this course is based upon the goals for the project theme, Safety Critical Scenarios, identified in learning objectives (LOb) and described as the specific learning outcomes (LO) that learners should be able to understand and do by the end of a course. Each learning outcome has been coded according to the specific kind of knowledge and level of cognitive processing required, using Bloom's revised taxonomy for defining educational objectives. This coding supports the determination of teaching and learning activities that will engage these processes, thus informing design of the TE&A strategies developed for the courses are proposed. The table that follows presents this mapping.

Table 9: Training for SAFE-UP demos LO, knowledge type, level of cognitive process and TE&A strategies

Goal	Specific Learning Outcomes	Knowledge Dimension	Cognitive Process Dimension	TE&A strategies included in E-Learning course
3. Safe on the roads **Relate to LOb4, LOb5.**	**3.3 Understand** what technologies is SAFE-UP developing and which traffic safety conditions they will assist.	Factual	Understand	IMAGES FACTS VIDEOS

The e-Learning course that has been sketched to cover all the aforementioned Specific Learning Outcomes is available at SAFE-UPs website, here https://www.safe-up.eu/resources, and its detailed structure is presented at the following table. The storyboards on which the e-Learning course have been based upon are presented in Appendix D. The e-Learning course has been developed within the framework of Task 6.2 and will be tested using the methodology to be developed in T6.4. Any updates that might occur will be reported in the last deliverable of this WP, namely D6.5 "Knowledge Translation, outreach, safety awareness update".

Table 10: e-Learning course 4: Getting to know SAFE-UP Demos contents and description

SAFE-UP e-Learning course 4: Getting to know SAFE-UP Demos Time: [85 min]	The scope of this e-Learning course is to provide the target audience with specific information about the SAFE-UP demos, who they have been developed, which technologies they are using, what is the purpose behind their development and how they could have a positive impact on traffic safety. The e-Learning course also provides the target audience with the appropriate links, where public information regarding demos can be found, that includes additional information based on their interest.			
Lesson number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**
1	**Introduction**	**In this section you will** • **Get familiarized with technologies and road safety** • **Get a short presentation of the SAFE-UP demos.**	**3.3**	**5**
1.1	Automated Safety Technologies briefing	The audience gets familiar with the fact that technologies are used in order to enhance traffic safety	**3.3**	2
1.2	SAFE-UP demos in a nutshell	SAFE-UP demos are presented as a whole.	**3.3**	3
2	**Demo 1: New seating positions for highly automated vehicles**	**In this Section you will** • **Get familiar with Demo 1 "New seating positions for highly automated vehicles"**	**3.3**	**20**
2.1	Demo 1 introduction	The audience understands the functionalities of SAFE-UP Demo 1.	**3.3**	5
2.2	Demo 1 technical details	The audience gest familiar with the technologies used in Demo 1.	**3.3**	5
2.3	Demo 1 capabilities and limitations	The audience gest familiar with the capabilities and limitations of Demo 1.	**3.3**	5

Lesson number	Title	Description	Learning outcome number	Est. time (minutes)
	SAFE-UP e-Learning course 4: Getting to know SAFE-UP Demos **Time: [85 min]**	The scope of this e-Learning course is to provide the target audience with specific information about the SAFE-UP demos, who they have been developed, which technologies they are using, what is the purpose behind their development and how they could have a positive impact on traffic safety. The e-Learning course also provides the target audience with the appropriate links, where public information regarding demos can be found, that includes additional information based on their interest.		
2.4	Demo 1 testing	The audience gest familiar with the testing process of Demo 1.	**3.3**	3
2.5	Demo 1 more information	The audience gest links were more information regarding Demo 1 are presented.	**3.3**	2
3	**Demo 2: VRU detection under bad weather conditions**	**In this Section you will Get familiar with Demo 2 "VRU detection under bad weather conditions"**	**3.3**	**20**
3.1	Demo 2 introduction	The audience understands the functionalities of SAFE-UP Demo 2.	**3.3**	5
3.2	Demo 2 technical details	The audience gest familiar with the technologies used in Demo 2.	**3.3**	5
3.3	Demo 2 capabilities and limitations	The audience gest familiar with the capabilities and limitations of Demo 2.	**3.3**	5
3.4	Demo 2 testing	The audience gest familiar with the testing process of Demo 2.	**3.3**	3
3.5	Demo 2 more information	The audience gest links were more information regarding Demo 2 are presented.	**3.3**	2

SAFE-UP e-Learning course 4: Getting to know SAFE-UP Demos Time: [85 min]	The scope of this e-Learning course is to provide the target audience with specific information about the SAFE-UP demos, who they have been developed, which technologies they are using, what is the purpose behind their development and how they could have a positive impact on traffic safety. The e-Learning course also provides the target audience with the appropriate links, where public information regarding demos can be found, that includes additional information based on their interest.

Lesson number	Title	Description	Learning outcome number	Est. time (minutes)
4	**Demo 3: Advanced intervention functions for VRU accident avoidance**	**In this Section you will get familiar with Demo 3 "Advanced intervention functions for VRU accident avoidance"**	**3.3**	**20**
4.1	Demo 3 introduction	The audience understands the functionalities of SAFE-UP Demo 3.	**3.3**	5
4.2	Demo 3 technical details	The audience gest familiar with the technologies used in Demo 3.	**3.3**	5
4.3	Demo 3 capabilities and limitations	The audience gest familiar with the capabilities and limitations of Demo 3.	**3.3**	5
4.4	Demo 3 testing	The audience gest familiar with the testing process of Demo 3.	**3.3**	3
4.5	Demo 3 more information	The audience gest links were more information regarding Demo 3 are presented.	**3.3**	2
5	**Demo 4: Communication framework for warning Vulnerable Road Users**	**In this Section you will** • **Get familiar with Demo 4 "Communication framework for warning Vulnerable Road Users"**	**3.3**	**20**
5.1	Demo 4 introduction	The audience understands the functionalities of SAFE-UP Demo 4.	**3.3**	5

SAFE-UP e-Learning course 4: Getting to know SAFE-UP Demos Time: [85 min]	The scope of this e-Learning course is to provide the target audience with specific information about the SAFE-UP demos, who they have been developed, which technologies they are using, what is the purpose behind their development and how they could have a positive impact on traffic safety. The e-Learning course also provides the target audience with the appropriate links, where public information regarding demos can be found, that includes additional information based on their interest.

Lesson number	Title	Description	Learning outcome number	Est. time (minutes)
5.2	Demo 4 technical details	The audience gest familiar with the technologies used in Demo 4.	**3.3**	5
5.3	Demo 4 capabilities and limitations	The audience gest familiar with the capabilities and limitations of Demo 4.	**3.3**	5
5.4	Demo 4 testing	The audience gest familiar with the testing process of Demo 4.	**3.3**	3
5.5	Demo 4 more information	The audience gest links were more information regarding Demo 4 are presented.	**3.3**	2

4.3.5 Safety Topic: Automation in transport today and in the future

The content of this course is based upon the goals for the project theme, Safety Critical Scenarios, identified in learning objectives (LOb) and described as the specific learning outcomes (LO) that learners should be able to understand and do by the end of a course. Each learning outcome has been coded according to the specific kind of knowledge and level of cognitive processing required, using Bloom's revised taxonomy for defining educational objectives. This coding supports the determination of teaching and learning activities that will engage these processes, thus informing design of the TE&A strategies developed for the courses are proposed. The table that follows presents this mapping.

Table 11: Training for automation LO, knowledge type, level of cognitive process and TE&A strategies

Goal	Specific Learning Outcomes	Knowledge Dimension	Cognitive Process Dimension	TE&A strategies included in E-Learning course
1. Risk avoidance **Relate to LOb1, LOb2, LOb6, LOb7, LOb8**	**1.1 Understand** the current SCSs for drivers and pedestrians	Conceptual	Understand	INFOGRA-PHICS TIP SHEETS
	1.2 Remember the characteristics of risk-taking • What is risk • Judging risk in various situations (SCS)	Factual	Remember	FACTS SELF-ANSWERED QUESTIONS
	1.3 Remember how risk perception is affected by personal factors • mental factors • role of self-control • perception of other drivers and pedestrians	Factual	Remember	VIDEOS QUESTIONS/ QUIZ
3. Safe on the roads **Relate to LOb4, LOb5, LOb7, LOb9.**	**3.1 Understand** the history of Automated vehicles	Factual	Remember	FACTS & FIGURES
	3.2 Describe the levels of automated vehicles and the technologies used	Factual	Remember	FACTS & FIGURES VIDEOS
	3.3 Understand basics on how automated vehicles work	Conceptual	Understand	FACTS IMAGES VIDEOS
	3.4 Understand basics on how Cooperative automated vehicles work	Conceptual	Understand	FACTS IMAGES EXAMPLES
	3.5 Describe the strengths and the limitations of driving Automation	Factual	Remember	FACTS & FIGURES
	3.6 Understand the status of the automation in the market	Conceptual	Understand	FACTS IMAGES EXAMPLES
	3.6 Understand how SAFE-UP technologies	Factual	Remember	FACTS & FIGURES VIDEOS

Goal	Specific Learning Outcomes	Knowledge Dimension	Cognitive Process Dimension	TE&A strategies included in E-Learning course
	will assist the progress automation			

The e-Learning course that has been sketched to cover all the aforementioned Specific Learning Outcomes is available at SAFE-UPs website, here https://www.safe-up.eu/resources, and its detailed structure is presented at the following table. The storyboards on which the e-Learning course have been based upon are presented in Appendix E. The e-Learning course has been developed within the framework of Task 6.2 and will be tested using the methodology to be developed in T6.4. Any updates that might occur will be reported in the last deliverable of this WP, namely D6.5 "Knowledge Translation, outreach, safety awareness update".

Table 12: e-Learning course 4: Automation in transport today and in the future contents and description

SAFE-UP e-Learning course 5: Automation in transport today and in the future. Time: [114 min]	The scope of this e-Learning course is to allow general public to build an understanding around the autonomous vehicles framework and understand the technologies, challenges, and opportunities of their adoption as a key element in urban mobility.			
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**

1	**Road transport today and Safety critical situations**	In section you will
		• **Be informed about the current Safety Critical Scenarios**
		• **Understand the most common collision situations and characteristics**
		• **Create enhances perception and anticipation of risks associated with existing traffic patterns**
		• **Develop respectful and responsible attitudes towards road safety**
		• **Understand the characteristics of risk-taking**
		  • **What is risk**
		  • **Judging risk in various situations (SCS)**
			1.1
			1.2
			1.3
				27 min

1.1	Introduction to risk and crashes	What are risks and what are emergency situations What is the difference between accidents and road traffic crashes and which term we should use	1.2 1.3	12 min

SAFE-UP e-Learning course 5: Automation in transport today and in the future. Time: [114 min]	The scope of this e-Learning course is to allow general public to build an understanding around the autonomous vehicles framework and understand the technologies, challenges, and opportunities of their adoption as a key element in urban mobility.			
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**
1.2	Car-to-Pedestrian crashes facts	Present and describe the numbers of accidents per mode, as well as the most common crash crashes among cars and pedestrians based on SAFE-UP outcomes. Make the users think how they feel is the presented situations already. Present the most common collision situations and their characteristics.	1.1	15 min
2	**Getting to know Automated vehicles**	**In section you will** • **Be informed about the history of vehicle automation** • **Understand the automated vehicle Levels of automation, how automated vehicles work, which are the technologies that are used at automated vehicles. What are the Connected and cooperative vehicles.** • **Get familiar with the benefits and the aspects of concern regarding automation.** • **Understand what is still pending to be done before we see automated vehicles on the streets.**	3.1 3.2 3.3 3.4 3.5 3.6	25 min
2.1	The history of automation	Present the evolution of vehicle automation. When it started and how it has evolved during the years.	3.1	3 min
2.2	Ride into the future	Present the Levels of automation, how automated vehicles work, which are the technologies that are used at automated vehicles. What are the Connected and cooperative vehicles.	3.2 3.3 3.4	10 min
2.3	Benefits and aspects of concern regarding automation	What are the expected benefits from automated vehicles and which are still the points that concern us.	3.5	5 min

SAFE-UP e-Learning course 5: Automation in transport today and in the future. Time: [114 min]	The scope of this e-Learning course is to allow general public to build an understanding around the autonomous vehicles framework and understand the technologies, challenges, and opportunities of their adoption as a key element in urban mobility.			
Section number	**Title**	**Description**	**Learning outcome number**	**Est. time (minutes)**
2.3	Next steps to automation	Why we have still time before the automated vehicles become a reality. Which are the aspects still to be solved.	3.6	7 min
3	**How SAFE-UP technologies can improve safety through Automation**	**In this Section you will** • **Understand the safety benefit of a "safety system" where the behavioral aspect tackled at the aforementioned Sections is coupled with technological advances that enhance safety in a holistic form.** • **Familiarise with the upcoming technological trends that will be part of mixed traffic.** • **See the SAFE-UP demos and understand how they are addressing specific road traffic problems of today.**	**3.3**	**22 min**
3.1	Introduction: Safety System Approach	Understand the safety benefit of a safety system where the behavioral aspect tackled at the aforementioned Sections is coupled with technological advances that enhance safety in a holistic form.	3.3	3 min
3.2	Demo 1	Familiarize with the SAFE-UP Occupant monitoring and restraining systems	3.3	3 min
3.3	Demo 2	Familiarize with the SAFE-UP Improved VRU detection under bad weather conditions	3.3	3 min
3.4	Demo 3	Familiarize with the SAFE-UP Advanced intervention functions	3.3	3 min
3.5	Demo 4	Familiarize with the SAFE-UP Enhanced VRU safety system	3.3	3 min

4.3.6 Interactive design elements

The e-Learning courses contains various interactive design attributes to enhance the learning process. These are the following.

- Active elements the user can click and new information appears that is not available at the initial screen

Figure 10: Examples of active elements the user can click

- Self-evaluation quizzes

Figure 11: Examples of Self-evaluation quizzes

- Active clickable bubbles for more insights

Figure 12: Examples of clickable bubbles

- Active clickable tabs with different content

Figure 13: Examples of clickable tabs with different content

- Simulator Videos

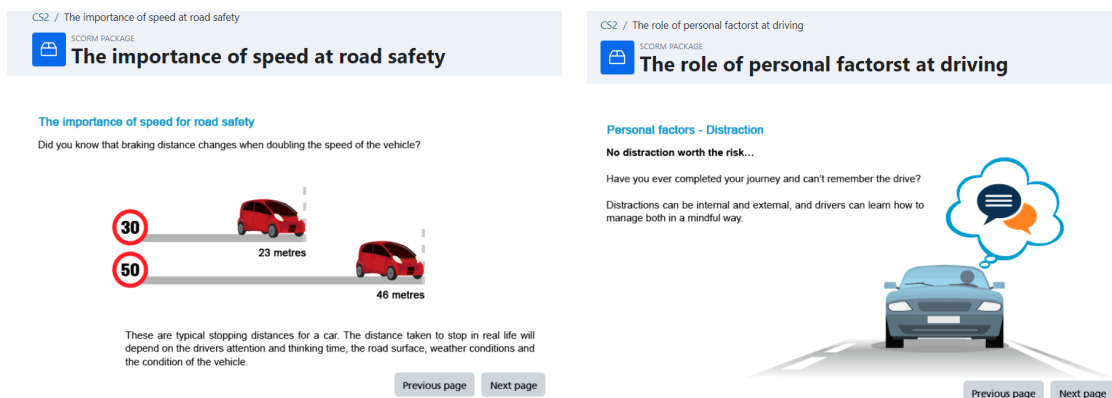
Figure 14: Examples of videos

- Animations

Figure 15: Examples of animations

4.4 Initial training priorities in future SCS

Outcomes from WP2 and specifically from Task 2.1 on current SCS in car-to-pedestrian, car-to-cyclist, and car-to-PTW rider crashes have provided the earliest inputs to WP6 and they are the basis of all our training material, since they are considered fundamental to all the technical work packages. Several infographics have been created to provide an overview for general audiences on the activities of each work package and their use of T2.1 results (see Section 4.2.1). The results from deliverable D2.6 are available and have been used in identification of target safety themes and translated into initial main messages and TE&A goals for T6.2 and T6.3. Results for Task 2.5 Future safety-critical scenarios are pending later in the project, so the way they will be handled in future research will be elaborated at the next Deliverable of WP6, namely D6.3 "Knowledge Translation, outreach, safety awareness update" that will be submitted at the end of the project. The intention during the second KT cycle is to define new MMs based on the emerging outcomes for future safety-critical scenarios and safety innovations and either integrate these to update materials created in the first cycle or update with new KT goals, or both.

5 Discussion and next steps

At this time, the project stands in a really critical period where the various developments are progressing towards their finalisation. Based on the outcomes of the technical work packages so far, we have managed to conceptualise and develop a quite thorough set of training materials that cover all the technical aspects of SAFE-UP. The outcomes that are still pending and are to be finalised in the following months will not be included in the TE&A process as outcomes, but as proposals and guidelines for further research and development. So, the final Deliverable to come from this WP, namely D5.6 "Knowledge Translation, outreach, safety awareness update" M36, will also include a roadmap for future TE&A actions. Some of the aspects that are expected to be detailed in this report are the engagement of URU stakeholders in planning & implementation of road safety innovations and the initial training priorities, including LOs which could be updatable, new data & developments for future safety scenarios.

Also, a part of this WP is to evaluate the training material developed and are available on the projects website here (link to be added when the e-Learning platform is ready). The methodology for the evaluation will be reported in the next Deliverable of this WP, namely D6.5 "Training evaluation framework, material and results", and it will be based on the initial list of general KPIs (below) for training and educational programs that was outlined during the proposal phases. This list will be refined according to findings on specific Knowledge Users needs and interests, and defined target TE&A activities.

Initial list of general KPIs

1. Training programme effectiveness.
2. Potential impact on targeted users.
3. Training content relevance and accessibility to ensure user uptake.
4. Media, formats and messages are inclusive, addresses diversity.
    - adaptable to specific user types, demographic groups.
    - relevant to cultural, regional & infrastructure contexts.

Detailed KPIs and suggested indicators for evaluating TE&A programs and initiatives have already been presented in Deliverable 6.2 (See table 4.6). These have been defined by integrating identified TE&A objectives with information collected on targets KU needs, and adapting evaluation guidelines and metrics from the Knowledge Translation Planning Template and the Constructive Alignment framework. These KPIs will also be updated and used in our evaluation phase, including content, format and delivery, as well as user-centred tailoring (e.g. regional, age, etc.) of educational and knowledge products.

6 Conclusions

The current report is the outcome of T6.2 Training programme content of WP Training activities and awareness creation on future traffic scenarios. The objective of this task is to raise road users' general awareness about road safety in future traffic scenarios by enable knowledge translation of results from transport safety & innovation research, educational material and guidelines.

In the context of this Task the methodology that has been developed in previous WP6 Deliverables, namely D6.1 [3] has been implemented and also the KT outcomes that have been developed within the framework of T6.3 Knowledge Translation, outreach and raising awareness, have been enriched and included in our TE&A materials. So, apart from all the existing and new KT material have been created (within WP6 or other WPs –i.e. demo videos, etc.) five e-Learning courses have been developed in the framework of T6.2 to enhance the training, education and awareness of the target audiences regarding the main outcomes of the SAFE-UP projects (the SCS and the demos) but also on general road safety issues. The e-Learning platform of SAFE-UP is on moodle and the five developed courses are the following:

1. Drivers' and pedestrians' safety on the road
2. Drivers' and bicyclists' safety on the road
3. Drivers' and PTW riders' safety on the road
4. Automated vehicles today and in the future
5. Getting to know SAFEUP's Demos

All the TE&A material exists at the moment at the project's website but by the end of the project will be all included in one unified place, the KT library hosted also at the project's web site.

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