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# ASTONRAIL - Intellectual Output 4 – Framework

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## ASTONRail Framework: goals and practice

Today's higher education institutions (HEI) are required to strive for quality, not only due to society's growing demands but also because they are one of the major drivers of society's competitiveness as a whole (Fernandes, 2017). The knowledge society is becoming increasingly demanding, and as a result, it is necessary to measure, assess then improve it. ASTONRail project targeted railway education at HEI across Europe. As a result, the WP4 suggested a framework that considered several improvements in three main areas: teaching methods, delivery, and assessments. The collected data were gathered by conducting interviews with senior lecturers from seven European universities.

### Teaching Methods:

To improve this area in railway education, teaching should include a combination of methods and employ an innovative multi-disciplinary approach. All the participants emphasise the importance of keeping lectures sessions. Lectures help to introduce key concepts and approaches and to explain specific points on the course objectives. Additional activities in class and laboratories with specific tasks and challenges were suggested. That helps to create direct contact with practice. Learning from practice can also happen through specific tasks, frequent/internal problems, and case studies to be distributed between students to solve. In addition, invite professionals with railway backgrounds from railway companies, infrastructure managers, safety agencies, transport, and regulatory authority. It can help in promoting intimate contact between students and distinguished professionals. Students are also encouraged to practice Peer-teaching, stimulating within groups, and group-to-group discussions before asking the teacher.

Improving the classical skills development approach can have a positive impact on developing learning skills. Findings demonstrated the vital role of implementing the following actions through teaching sessions. For example, students will be encouraged to Present, ask, discuss, challenge, reflect, collect, evaluate /interpret, critical thinking, collaborate, inspire, emulate, and asses. Therefore, it is crucial to identify the role of the teacher. (McWilliam, Erica L.,2009) illustrated that teacher can be acting as Director, Leading Learner, Nurturer, and as Facilitator.

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In rail-specific subjects, the teacher can be a director when delivering Lectures to introduce key concepts and approaches. Meddler when students are asked to complete specific tasks; and challenges; The teacher can also be a Meddler in motivation and attracting students' attention, clarification, and justification of the relevant topics. The facilitator role can be practiced when the teacher prepares and uses supporting teaching materials when frequent problems are given for students to solve; when gradually guides the student's steps or organises work in groups. Lastly, the teacher can be Nurturer when he/she is challenging the students with a problem to solve, during the practices in labs and when organising activities so that each student is involved creatively and effectively in the learning process.

In the dynamic and multi-disciplinary skills development approach, the teacher will experience all four educator's roles, which can help in the shift from descriptive to critical analysis. Demonstrating a deep understanding of the informed practice and critical reflection can be brought by considering diverse perspectives: from the teacher's, the stakeholder's, and the student's perspectives. In this approach, the stakeholder will observe, contribute, and benefit as appropriate. While the student will actively learn from a combination of teaching and learning activities. As a result, engagement and positive learning outcomes will be ensured when students receive inputs from academia, experts, railway professionals, other students, and researchers. Therefore, they should have the attitude to act in a multifaceted professional environment and the awareness that the differences in viewpoints themselves are always bringing cultural richness. In this approach, the course teaching staff is focused on creating a learning atmosphere appropriate to the objectives of the modules. The competencies of the course are key along with the student experience, focused on contents, theoretical issues, practical training, professional experience, and research. However, the main challenge of this dynamic approach is the ability to help the student to transit from description thinking to critical thinking in class and during the seminars and expositions. Active learning is still a challenge that needs to be favoured with new exciting and innovative approaches.

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## Assessments Techniques:

In higher education, most assessment strategies, such as course assignments, serve both a formative (assessment for learning) and a summative (assessment of learning) function (Hernández, 2012; Taras, 2009). (Rawluszky, 2018) addressed ongoing academic concerns about whether assessment practices in higher education support student learning.

The findings suggested that only one form of assessment should be avoided (examples as following)

- 1- The 2-hour closed book exam on campus to be replaced by a 24-hour open book online exam.
- 2- Face-to-face oral exam with a full discussion on topics and frequent jump to different topics allows the best assessment of the awareness and the capabilities acquired by the students in a systemic, non-sectorial perspective.
- 3- All activities carried out by the students are considered in the final assessment, including individual and group work, practices, class work and the written exam.
- 4- Examinations through several tests during the semester with student-centred assignments and a final exam at the end of the semester (more teacher-centred, at least one individual non-group examination)

All participants highlighted the importance of assessing the outcome of each learning activity. They also encouraged a shift from exam-based assessments (e.g., written and open-question exams) towards more project/coursework-based assessments (e.g., the completion of a project based on applying the courses' contents).

## Teaching Delivery Mode

ASTONRail findings in WP4 suggested to identify and establish the right balance between:

- 1- Information acquisition vs knowledge construction.
- 2- Teacher-centred learning vs student-centred learning
- 3- Lectures in classrooms (theory) vs practical sessions in laboratories
- 4- Distance learning vs self-studies
- 5- Student mobility vs distance learning

Table 1 presented the distribution between teaching delivery methods as suggested by participants. Based on the data presented in Table 1, lectures are still the prominent method to delivery knowledge to students.

University Practice	Visits or labs	Lectures	Specific tasks for students to complete	self-studies	Distance learning and student mobility	Seminars
1		50%	25%	15%	10%	
2	15%	35%	15%	30%		
3	10%	50%	20%	10%		10%
4	10%	50%	20%			20%
5		30%	30%	30%		10%
6		50%	30%			20%

Table 1 Delivery methods (in %)

A major focus of WP4 was linking teaching and research (Research-based teaching and learning). Such as bringing the research to the class: by the search for recent papers in the field and open discussion; introducing related projects conducted by the academic staff to the students, or inviting experts in the field from academia to the seminars. Furthermore, when possible, integrate students with little tasks in ongoing research projects. Frequent contact with Ph.D. students would also help them to better focus on research topics and approaches and make them more familiar. Sometimes, online conferences are an opportunity for students to participate and be exposed to academic discussions.

In the class, students could be asked to research and design new rail systems that are safer and more secure. As a result, the students will be given a chance to explore their ideas and acquire knowledge through rail research and systems design. Also, involving students in analytical surveys, in research directly in transport companies, information gathering for example for regions, and municipalities, based on student training for conditions in practice can be an opportunity to integrate into the research field.