Chapter Two

Designing Coil Courses with Impact: A Systematic Approach Using the Virtual Collaborative Learning Framework

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https://doi.org/10.53615/978-83-65020-54-3/23-33

Introduction

The Virtual Collaborative Learning (VCL) framework has become a widely used didactic approach to promote 21st-century skills, including intercultural competence, self-organisation, and digital collaboration. This chapter explores the research findings of over 2 decades of iterative research and the implications drawn from them. It focuses on the four design dimensions: Technical Platform, Realistic Case Studies, Professional Pedagogical Support and Learning Analytics (Altmann et al., 2024; Schoop et al., 2021; Altmann & Clauss, 2020).

In addition to the more than 80 VCL modules that have now been realised at the Chair of Information Systems with international partners from over 20 nations, capacity building has also been taking place since 2019 as part of the Erasmus+ projects VALEU-X and COWEB for implementation. The VALEU-X project, which was completed in January 2023, initially focused on the target country, Albania and implemented the VCL framework at 6 partner universities in a two-stage pilot phase. The follow-up project COWEB is rolling out capacity building to the

Dermol, V., Demaj, E., Nuka, D., & Altmann, M. (Eds.) (2025). *Higher education contemporary learning landscape: Virtual collaborative learning.* ToKnowPress.

Western Balkans region and spreading the use of VCL to universities in Albania, Kosovo, Bosnia and Herzegovina, and Montenegro (Vladi et al., 2020; COWEB Erasmus+ Project, 2023)

Virtual Collaborative Learning shares many principles with COIL (Collaborative Online International Learning), such as cross-institutional teamwork, online collaboration, and intercultural exchange. However, while COIL focuses more on international and intercultural exchange, VCL provides a framework for the design and implementation of online scenarios in local and international contexts (Altmann et al., 2024; Hackett et al., 2023). Hackett et al. (2023) stress that empirical research on COIL is currently rare and mostly on a small scale, which underlines the need for a deeper exploration with a broader sample. For this reason, this chapter deals with a summary of the VCL concept, which should serve as a basis for further research and focuses here on the design of the framework. After presenting the theoretical and pedagogical foundations, the VCL framework with its four design dimensions is presented: Realistic Case Studies, Professional Pedagogical Support, Technical Platform and Learning Analytics. The key factors of the framework are then summarised in a conclusion.

Theoretical and Pedagogical Foundations

The design of Virtual Collaborative Learning is based on current educational theories that propagate active, social, and networked learning. VCL thus responds to the challenges of globalised education by bringing together digital pedagogy with international collaboration and creating a framework for competence-oriented and technology-supported learning in transnational contexts (Altmann & Clauss, 2020; Schoop et al., 2020; Altmann et al., 2024).

The following learning theories are included in the VCL framework: Constructivism, Social Learning Theory and Connectivism:

- *Constructivism* states that learners actively construct their knowledge through experience, reflection, and engagement (Piaget, 1977; Bruner 1990). In the VCL context, learners construct meaning by solving open-ended problems in authentic real-world scenarios (Altmann et al., 2024). The framework promotes self-directed exploration and interpretation, essential for developing autonomy and problem-solving skills.
- According to Vygotsky (1978) and Bandura (1977), *Social Learning*

Theory states that social interaction plays a key role in cognitive development. Through VCL, learners enter their Zone of Proximal Development (things learners can do with help) through peer collaboration and guided support from e-tutors. The small heterogeneous groups in the VCL framework promote interdependence, mutual learning, and negotiation-core principles of social constructivism.

- *Connectivism,* according to Siemens (2005), reflects the influence of virtual networks on learning. The learning theory assumes that knowledge is not only formed in individuals, but that it is above all the connections between people and digital nodes that ensure this. VCL is a networked learning framework in which learners acquire digital and collaborative skills by engaging with different tools and platforms.

This combination of learning theories enables VCL to cultivate 21st-century skills such as critical thinking, intercultural competence, self-organisation, and digital fluency (Altmann & Clauss, 2020; Schoop et al., 2021; Altmann et al., 2024). Another foundation of the VCL framework is the integration of internationalisation and digital pedagogy. while traditional academic mobility is often possible for financially and institutionally privileged students, Virgil Collaborative Learning offers accessible and structured intercultural collaboration for all students (Altmann & Clauss, 2020; COWEB Erasmus+ Project, 2023). This blend of global perspective and digital infrastructure not only supports learners but also encourages higher education institutions to expand their capacity for innovative, transnational pedagogy (Altmann et al., 2024).

The VCL Framework

The global digital transformation and the growing need for collaborative and intercultural learning opportunities are permanently changing the higher education landscape (Redecker & Punie, 2017; Skantz-Åberg et al., 2022). Since 2001, the Chair of Information Management at TU Dresden has iteratively developed and implemented VCL in over 60 courses, with recent iterations responding to the COVID-19 pandemic by further refining its format (Schoop et al., 2021). The VCL framework is divided into four design dimensions that provide the basis for a holistic design of new modules. The design dimensions are described in detail below.

Realistic Case Studies

The VCL framework is realised through the design of realistic case scenarios. This means that students work on complex problems that have been generated from a real-life situation. These case scenarios should then be aligned with the learning objectives of the module and take into account the students' prior knowledge. In this way, the complexity of the tasks in the module should also increase step by step, as this has an influence on the students' collaboration activities. The highest level of complexity requires activity, collaboration, reflection, and critical thinking from all group members. An adjustment of the complexity can be influenced by the task design by adjusting the information provided, the guidance and the division into sub-tasks. Professional pedagogical support is always available as a first point of contact to support students in the event of uncertainty or excessive cognitive load (Altmann et al., 2024).

Nevertheless, the limited structure offers the groups a great deal of room for manoeuvre when solving problems, which includes the independent selection of methods, tools, and division of work. Furthermore, the independent organisation of the learning process promotes the interdisciplinary skills of the learners. This includes, for example, collaboration, organisational and project management skills (Schoop et al., 2021).

Figure 2.1 shows a typical VCL process that is divided into synchronous (dark in the figure) and asynchronous (light in the figure) phases. The case-based learning is organised over a period of six to eight weeks and divided into weekly phases with deadlines for project plans, project reports and tasks. The tasks are open-ended, which means that there is no single, correct solution, but the path to the solution is included in the assessment. However, the submission of results on a weekly basis is mandatory. The content-related tasks are combined with subject-specific methodological skills and the use of digital tools, which promotes the students' digital skills as well as their methodological and social skills (Schoop et al., 2021).

The current case study from the COWEB project should serve as an example to illustrate this. In this study, students from 9 different universities come together in heterogeneously mixed groups to work on a complex problem over a period of 8 weeks. In this case, the starting point is a bicycle route that will open in 2024 and run through all the

Kick-off 9/4/2025	*VCL Phase 1* 10/4/2025–23/4/2025	*Workshop* 23/4/2025	*VCL Phase 2* 24/4/2025–7/5/2025	*VCL Phase 3* 8/5/2025–21/5/2025	*Final Presentation* 4/6/2025
	Task 1 Onboarding (9/4–16/4) *Task 2* Common ontology (17/4–23/4)		*Task B1* Market analysis & brainstorming on business ideas (24/4–30/4) *Task B2* Business analysis (30/4–7/5)	*Task C1* Revenue model, budget planning & interim presentation (8/5–14/5) *Task C2* Marketing strategy & branding (15/5–21/5) Finalizing business solution development (22/5–3/6)	
VCL Basics Group division, definition of roles, & assessment criteria		Business canvas			Pitch presentation

FIGURE 2.1 Phases of a Common VCL Module (adapted from Altmann & Arnold, 2024)

countries of the Western Balkans. In addition to the participating universities, the route operator of the Trans Dinarica is also involved in the implementation of the case study. Figure 2.2 shows the call that the students receive at the beginning of the module.

As part of the module, after the synchronous kick-off event, the students first create a list of rules for their collaboration in the online phase, a so-called group work contract. This is followed by a joint ontology to bring prior knowledge up to a common level. Here, basic terms and definitions that are important in the context of the case study are identified and developed independently by the students. This is followed by a synchronous workshop in which the students learn the Business Model Canvas in application and theory. In the following asynchronous phases on the learning platform, the students gradually complete the individual building blocks of the Business Model Canvas and finally prepare a pitch, which is presented to a jury of professors at the end of the module. During the module, students are supported in any organisational and technical problems by e-tutors, whose role is described in more detail in the following section.

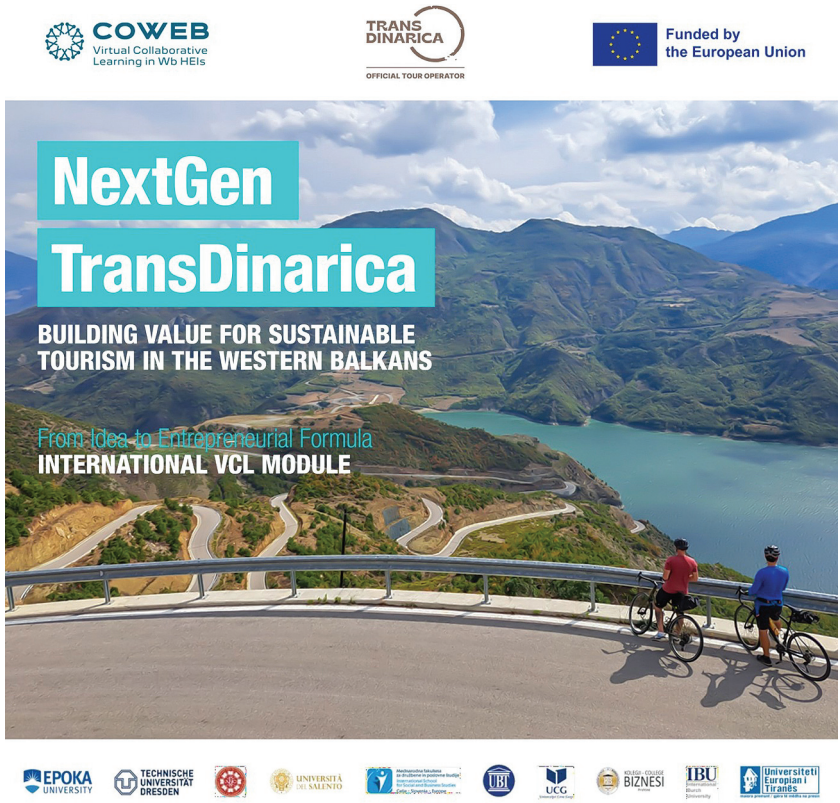

FIGURE 2.2 Teaser for VCL Case Study 2025

Professional Pedagogical Support

An important component of Virtual Collaborative Learning is professional pedagogical support. In contrast to conventional online learning environments, which often rely on feedback from teachers or peer interaction, the VCL framework embeds a structured e-tutoring model, which plays a central role in guiding implementation and supporting the learning process (Altmann et al., 2024; Schoop et. al., 2021).

E-tutors are usually advanced students at the master's or doctoral level who have previously been formally trained to support online case study work in small groups. Their training is based on a 'flipped classroom' format that includes didactic input, a practical phase in a VCL setting and continuous reflection (Altmann et al., 2024). This preparation helps them above all in the realisation of learner support, conflict management, intercultural communication, and digital tool literacy. It

is important to note that e-tutors are not subject experts and are not intended to evaluate the content of the students' solutions. In contrast, they function as a learning process support, helping groups to structure their collaboration on the online platform, manage their time and reflect on their methods. This aligns with constructivist and social-constructivist learning theories, which emphasise learner autonomy, self-organisation, and peer-supported knowledge construction (Dillenbourg, 1999; Schreiber & Valle, 2013).

One of the main tasks of e-tutors is the management of group dynamics in heterogeneous virtual teams. The learners have to organise themselves within different time zones, cultural backgrounds, and academic disciplines, often without previous experience in virtual collaboration. this is where the role of the e-tutor comes into play through the support of:

- *Organisational support:* Assisting with project planning, time management, and task division.
- *Technical support:* Guiding students in the use of collaborative tools and troubleshooting technical problems.
- *Social support:* Fostering a productive and inclusive group atmosphere, resolving conflicts, and promoting motivation.
- *Reflective support:* Encouraging metacognition and group reflection through structured formative feedback.

From an institutional perspective, the use of e-tutors allows for the scaling and high-quality of support within VCL modules. Modules supported by e-tutors show higher student engagement, better quality of collaboration and higher satisfaction compared to non-supported online group work (Altmann & Clauss, 2020; Schoop et al., 2021).

Technical Platform

To enable effective VCL, it is particularly important to use a technical platform that maps all the required elements. Asynchronous and asynchronous communication in channels must therefore be supported. The sharing of documents, the distribution of tasks and the visualisation of group processes. The platform should also be intuitive to use and accessible on different devices (Altmann & Clauss, 2020). The technical environment functions as a social and cognitive workspace where collaboration is not only supported but actively shaped. As Bächle (2006)

and Hippner (2006) argue, such platforms go beyond technical mediation – they are social software systems that structure group interaction and identity formation in digital environments. Altmann et al. (2024) and Schoop et al. (2021) have summarised the most important properties for the technical platform:

- *Communication Tools:* Including video conferencing, text chat, discussion forums, and collaborative whiteboards (e.g., Miro).
- *Coordination Tools:* Shared calendars, task boards (e.g., Trello-style Kanban), and role assignment features.
- *Collaboration Tools:* Real-time co-authoring in shared documents, cloud storage, and versioning (e.g., OneDrive or Google Docs).
- *Feedback Tools:* Commenting systems, peer review integration, and rubric-based self-assessment options.
- *Learning Analytics Dashboards:* To visualise interaction patterns, participation frequency, and group progress over time.
- *Digital Identity and Social Presence:* A well-designed platform fosters trust and collaboration by enabling personal profiles and informal social interaction.
- *Usability and Training:* User-friendly tools and structured onboarding are essential to reduce barriers and support effective participation.
- *Integration with Learning Objectives and Case Design:* Platform features should be tightly linked to learning goals, making tool use part of the competence development.
- *Future Directions:* AI and Adaptive Technologies – AI tools like chatbots and dashboards enhance scalability and feedback, but must be used transparently and ethically.

Platforms such as Microsoft Teams offer these features, with the special feature that they are combined in one tool and allow the integration of additional tools. The VCLS held at the TUD since 2019 rely on this social software for a smooth process and the creation of optimal learning conditions for students.

Learning Analytics

By using a digital learning platform, it is possible to collect and analyse the data traces of the learners to optimise the virtual collaborative learning experience. The aim is to support supervisors, tutors, and

learners with data-based insights into their learning process. Learning analytics will also enable formative assessment, early detection of problems in collaboration and conflicts and thus also data-supported pedagogical interventions (Altmann et al., 2024, Schoop et al., 2021).

This can be done using dashboards and visualisation tools. As part of the VCL framework, dashboards for e-tutors and education have been used since 2019 to display a visual summary of group performance. In particular, this includes changes in group activity over time, comparison of individual and group participation in the work and the density of interaction between individual group members, for example, the number of document chats, edits, and voice calls. The visualisations help to make evidence-based pedagogical decisions and reduce the cognitive burden on e-tutors. If the data is made available to the learners, this also supports the self-monitoring of the learning process (Schoop et al., 2021; Altmann et al., 2024).

In a further step to increase the scaling of the VCL module, conversational agents (chatbots) can be used. These can, for example, support automated reminders for the submission of tasks, technical or methodological FAQS, as well as prompt self-reflection. For example, a chatbot can detect that a group has not communicated for 48 hours and send the group a friendly reminder. Such automated micro-interventions can help to maintain the group's engagement in Project Bass Learning. Nonetheless, these should also be ethically reviewed and transparent in the use of data for all participants. Furthermore, students' consent should be obtained for the use of their data (Altmann et al., 2024).

Learning analytics can open the door to adaptive VCL environments in which complex support tasks can be dynamically adapted to the needs of students through e-learning, tutoring and feedback. With the current advent of artificial intelligence, this field offers great potential for scaling the VCL framework and making it attractive as a modern form of teaching in the future.

Conclusion

The Virtual Collaborative Learning Framework provides a modern and adaptable structure to implement collaborative, intercultural, and digitally supported learning in higher education. Based on the experience of over two decades of iterative development and international implementation, including capacity building in the Western Balkans through Erasmus+ projects, the framework shows how twenty-first-

century skills can be fostered through well-structured virtual environments. At its core, VCL consists of four interconnected design dimensions: realistic case studies, professional pedagogical support, technical platform, and learning analytics. Each dimension contributes to the development of learner competencies such as critical thinking, self-organisation, digital competencies, and intercultural communication. The theoretical foundations lie in the constructivism of social learning theory and connectivism, which ensure that learning is actively networked and socially meaningful. Compared to other international learning models such as COIL, VCL is deeper in detail for a systematic design implementation and evaluation of collaborative learning scenarios which makes this framework particularly attractive for long-term use and curricular integration.

Through ongoing, iterative reported research and the continuous improvement of digital tools and the potential to integrate Artificial Intelligence. Artificial Intelligence, VCL is a sustainable approach to internationalisation and digital pedagogy at the Higher Education Institute. VCL is scalable, transferable, and learner-centred and will therefore continue to be an attractive method of teaching and learning in the future.

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