Design Recommendations for Successful Cross-university Collaborative Group Work: Two Best Practices Cases

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Abstract: The ability to work in decentralised, location-independent, international teams using collaborative information and communication technology (ICT) has become an essential key competence for the vocational capability of knowledge workers all over the world. Nevertheless, curricular contents in higher education do not yet reflect the development of these key competencies to an extent commensurate with their crucial importance. Concrete best practice application cases and design recommendations are lacking, especially in a cross-university context. The aim of this paper is therefore to introduce the concept of virtual collaborative learning (VCL) and compare two concrete application cases of cross-university VCL-arrangements in formal learning settings in order to create a design framework and to derive concrete design recommendations. The multi-perspective evaluations of the presented cases show that successful cross-university VCL concepts are characterized by the e-tutorial support of group work, transparent learning objectives and evaluation criteria, the selection of relevant, realistic and job related topics and assignments, the intensive participation of the learners, formative feedback as well as learning analytics. Based on lessons learned during the cross-university online collaborations concrete design measures for the implementation of cross university VCL courses are derived.

1 INTRODUCTION

Two major trends on the labour market are the transformation from manufacturing to knowledge work and the distribution of work over large geographical distances. The ability to work in decentralised, location-independent, international teams using collaborative information and communication technology (ICT) has become an essential key competence for the vocational capability of knowledge workers all over the world (Perez-Sabater, Montero-Fleta, MacDonald, & Garcia-Carbonell, 2015). Both the European Union and the OECD highlight collaboration skills, virtual communication, problem solving, the purposeful use of networked online tools, the development of social skills and the creation of digital content as central key competencies for the 21st century (Carretero, Vuorikari, & Punie, 2017; Fadel, 2008; OECD, 2018; Trilling & Fadel, 2009; Vuorikari, Punie, Carretero Gomez, & Van den Brande, 2016). The following general objective of higher education was already defined in 2010:

"We are currently preparing students for jobs and technologies that don't yet exist... in order to solve problems that we don't even know are problems yet."[1]

The development of new jobs and collaborative technologies has been exponential during the last decade. Nevertheless, curricular contents in higher education do not yet reflect the development of these key competencies to an extent commensurate with their crucial importance (Aktas, Pitts, Richards, & Silova, 2017; Lönnblad & Vartiainen, 2012; Perez-Sabater et al., 2015; Simm & Marvell, 2017).

[1] The origin of this widespread quote seems controversial, as Gunderson, Roberts, & Scanland (2004) asociate it with a former U.S. Secretary of Education Richard Riley, while Fadel, author of "21st Century Skills.: Learning for Life in Our Times" (Trilling & Fadel, 2009), refers to the well-known YouTube video "Did You Know; Shift Happens" by Fisch & McLeod (2007) as source.

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Experts criticise that, despite broad theoretical competence frameworks, concrete best practice application cases and design recommendations are lacking (Erdoğan, 2015; Garrison & Kanuka, 2004; Rovai & Downey, 2010), especially in an cross-university context (Pisoni, Marchese, & Renouard, 2019). The aim of this paper is therefore to compare two concrete application cases of virtual collaborative group work in formal learning settings in order to create a design framework and to derive concrete design recommendations. Two different application scenarios are described, implemented design measures and concrete interventions in the scenarios are presented. The two cases were evaluated using two different evaluation approaches with different research objectives. In the first case, the focus was on the perceived usefulness of interventions and in the second case, on the identification of success factors of collaborative group work from the students' perspective. By combining the two evaluation approaches and research objectives, new findings are derived. The cases presented, their multi-perspective evaluation and the analysis of the lessons learned are aimed at answering the following research question: Which design measures facilitated successful cross-university collaborative group work?

The underlying theoretical core concepts as conceptual basis for the comparison of the two application cases and the subsequent development of design recommendations will be presented in the following.

1.1 Computer Supported Collaborative Learning

Learning is defined as the process of acquiring new or changing existing knowledge, skills, behaviour, values or preferences (Gross, 2015). Learning can occur either individually or as a group activity. According to Dillenbourg (1999), group learning processes can be distinguished in cooperative and collaborative learning. In contrast to cooperative learning, in which the learners are able to segment a group task and approach individual parts on their own responsibility, collaborative learning requires, that the group accomplishes the task together through joint development, discussion and common agreement on a group result.

Computer supported collaborative learning (CSCL) refers to situations in which computer technology has a crucial contribution to the design of collaboration within the learning process (Goodyear, Jones, & Thompson, 2014). Technology can enhance collaborative learning in multiple ways. It can provide, for example, a visual representation of the task, the collaborative product or the most important aspects of the process (Kay, Reimann, & Diebold, 2007; Suthers & Hundhausen, 2003). Furthermore, it can serve as a tool for structuring content and knowledge development (Lu, Lajoie, & Wiseman, 2010; Marttunen & Laurinen, 2001; Scardamalia & Bereiter, 2006). CSCL can occur face-to-face, from a distance, or in combinations of presence and remote activities (a presence workshop followed by an online discussion). It includes synchronous (real-time) and asynchronous channels of communication. The positive effect of (computer-aided) cooperation in learning has been empirically confirmed several times. In general, meta-analyses and systematic literature reviews show that the results of collaborative learning are superior to those of individual and competitive learning situations (Hattie, 2009; Johnson & Johnson, 1987; Slavin, 1990; Webb & Palincsar, 1996).

1.2 Virtual Collaborative Learning

Virtual Collaborative Learning (VCL) is a suitable framework that exploits this potential. It is a best practice framework for innovative blended learning arrangements, based on years of scientific research at the Chair of Business Informatics, esp. Information Management led by Professor Schoop at the TU Dresden (Balázs, 2005; Rietze, 2019; Tawileh, 2017). Blended learning refers to the "didactically meaningful combination of traditional classroom learning and virtual or online learning on the basis of new information and communication technologies (Seuferth & Mayr, 2002). VCL has been used continuously in formal learning modules since 2001. VCL arrangements transfer group lessons into the virtual space. A high level of self-organisation is required within the groups, as all members of the group are responsible for their joint work results. The students work on authentic business cases with clear practical relevance for a short time period of usually six weeks. Due to their blended learning character VCL-scenarios have the phases of knowledge acquisition, virtual group work and assessment. In order to enable working interdisciplinary and multi-perspectively, the students have to adopt different roles, which are often related to their interdisciplinary study programmes. For their exchange and process documentation, participants use social software and digital communication tools. Learners are supported in their collaboration by qualified e-tutors to maximise both individual and group learning outcomes. VCL focuses on the learning outcomes -

intercultural awareness, the ability to collaborate, the purposeful use of social tools and case study work - and offers successful students from all participating locations ECTS (European Credit Transfer System) credits and grades based on formative and summative assessments. "Formative evaluation includes all activities of the teacher and/or the learner that provide information that can be used as feedback, to modify teaching and learning activities" (Black & Wiliam, 1998). The general aim is to recognise and respond to students' learning to improve it during the learning process (Cowie & Bell, 1999). Summative evaluation in contrast is the final evaluation of the created assignments (Scriven, 1967). The VCL framework is content-independent. It can be used for a wide range of formal education topics, for example knowledge management, intercultural communication or digital learning.

VCL scenarios offer opportunities for exchange regarding cross-university collaboration. In the framework of VCL, students can take courses beyond the borders of their own university or exchange ideas with students of similar study programs without physically leaving their home university. However, such scenarios are extremely demanding in terms of their design, implementation and organization. Various institutional, curricular and cultural dimensions must be included in the planning of VCL scenarios, which reflect the individual characteristics of the respective institutions or study programs. This article therefore tries to derive and document the success factors in the planning and implementation of cross-university VCL scenarios.

2 CASE 1: DEVELOPMENT OF LEARNING MATERIALS VIA VCL

The VCL course of case 1 was held in cooperation of two universities in Germany. One student group was from the master programm “Further Education Research and Organisational Development” of the Dresden University of Technology and the other group was from Bachelor programm “Media Communication” of Chemnitz University of Technology. Both groups study in the fields of educational management and instructional design (Breitenstein, Dyrna, Heinz, Fischer, & Heitz, 2018).

The main objective of the course was to create ten-minute multimedia learning sequences in working groups across universities facilitated by educational technologies. As a result, a set of media products were created: apps, videos, screencasts and websites. A multilevel didactic concept including a largely self-organized group work, which is accompanied by e-tutors, was developed.

2.1 Design Measures in Case One

The following design measures were implemented in this VCL setting:

Knowledge Acquisition. In presence, students were provided with relevant content on the main topics, the use of digital media in further education and instructional design. The knowledge transfer took place in joint sessions, some of which were transmitted live to the other location using Adobe Connect. On the basis of this content and the knowledge acquired, the students developed their own topics for the creation of the digital learning sequences, which were processed as part of the group work across the universities.

Group Work. In the second phase, the students worked in mixed groups on the content and didactic design as well as on the technical implementation of the learning sequences. For the implementation, a concept was first developed in groups, in which learning goals, subject content and didactic and technical requirements were taken into account. Then the lecturers and e-tutors of both universities evaluated the concept. The students received written contend related feedback, which could be discussed within facultative expert constultations.

Assessment. The last step was the final presentation. This has been gamified by letting the groups compete against each other by pitches. They presented their products in short presentations in an online meeting via Skype. These were assessed both by the students and by the team of tutors and lecturers. Basis of the assessment of the group work was a criteria checklist, in which the individual group performances (conception, first beta draft of the learning sequence, final product, presentation, fulfilment of milestones) were analysed.

To support the virtual group work several interventions have been implemented, e.g.

- *e-Tutor Support:* Each of the groups was supported by an e-tutor tandem. The e-tutors had complementary foci. One e-tutor focused on technical and instructional psychology and the second e-tutor on content and didactics. They advised the students on their requests and facilitated the realisation of the learning sequences.

- *Content Related Feedback:* In the process of the course, the students created a first beta draft on which they received content related feedback from tutors and the supervising lecturers with regarding the priorities: Subject content, didactics and technical implementation.
- *Expert Consultations:* The students were offered the opportunity to take part in facultative expert consultations to discuss the reviews of the lecturers and tutors on their drafts.
- *Conceptual Templates:* The project team prepared templates for the creation of the concept for the learning sequences.
- *Group Work Concepts:* The students were provided with a group work concept. This concept presented a total of six different areas of responsibility (subject contents/didactics, technology, legal aspects, quality, planning/coordination, documentation) and the associated tasks involved in the development of a digital learning sequence.
- *Quality Assurance Guidelines:* The students were provided with quality assurance guidelines in the form of a checklist, which they were asked to follow when implementing the learning sequence.
- *Storyboard Templates:* The project team prepared templates for the development of the storyboard.
- *Group Contracts:* Group work began with the conclusion of a group contract. In this contract, the students agreed on their areas of responsibility and decided for a project manager in their group. This person was primarily responsible for coordinating and ensuring communication between lecturers, e-tutors and the group.

2.2 Evaluation of Case One

In total, 51 participants took part in the course and the final evaluation. The sample consists of 30 undergraduates (77 % female) in the bachelor program and 21 master candidates (76 % female). One part of the analysis was the evaluation of the above mentioned interventions of the virtual group work. Those were to be rated regarding to their perceived helpfulness. It indicates that the students predominantly perceived any kind of support or feedback provided by experts (i.e., the lecturer and the tutors) as most helpful. Furthermore, the provided conceptual aids (i.e., templates for the teaching and group concept and quality assurance criteria) were assessed to be of above average helpfulness. In sum, six out of the total eight described interventions were perceived as rather helpful (see figure 1).

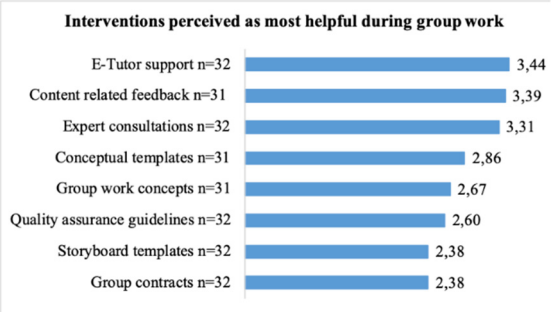

Figure 1: Evaluation of Interventions (Breitenstein et al., 2018).

3 CASE 2: HUMAN RESOURCE MANAGEMENT

Case 2 was held in Germany as part of a cross-university cooperation between the business and economics faculties at the “Technische Universität” (TU) Dresden, as a full university, and at the “Hochschule für Technik und Wirtschaft” (HTW) Dresden, as a university of applied sciences. The students were Bachelor's and Diploma students and interdisciplinary mixed. These disciplines included business, business informatics, business education and industrial engineering from the technical university and business from the university of applied sciences.

The aim of the project, which spans two different types of higher education institutions, is to implement a learner-centred and integrative course on the subject of human resources management. Didactically prepared case studies, made available in the virtual classroom under teletutorial supervision for processing in mixed small groups, enable an application-oriented deepening of subject knowledge and are intended to create awareness of real-life business situations. Furthermore, active work on authentic and practical scenarios promotes the development of social skills, media skills and self-organisation skills of students (Tawileh, Bukvova, & Schoop, 2013). Thereby the participants are supported by specially qualified e-tutors. They provide content related support in case of questions and misunderstandings, but also offer individual and group support, technical support, as well as organisational support.

3.1 Design Measures in Case Two

The following design measures were implemented in the VCL setting:

Knowledge Acquisition. During the preparation phase, participating students could access e-lectures for theoretical knowledge transfer. They were didactically processed and enriched using the e-lecture tool "Camtasia". The e-lectures were provided to the participants before the course, which allowed them to use time in the real and virtual classroom for joint discussion and practical application of the contents provided. The e-lectures supply a homogeneous basic knowledge among students of both universities in order to facilitate their entry into joint group work.

Group Work. In the virtual teamwork phase, the participants collaborate on a complex, realistic problem in the form of a case study on the provided open source platform elgg (https://elgg.org/). The selection of suitable tools and technical framework conditions creates the basis for an effective virtual collaboration between the learners. The necessary functions for synchronous and asynchronous communication (e.g. forum, blog, wiki, chat etc.) were taken into account. The students were free to use alternative online tools of their choice to complement the platform. Such external work had to be protocolled by the students on the platform. The communicated guiding principle was that only learning processes that were visible on the platform can be assessed and evaluated. The focus of the virtual group work was the solution of tasks with a close connection to possible company problems and future professional tasks. The tasks to be solved in the group work are characterized by open solutions requiring explanation, which concentrate on gaining new practical knowledge through discussion and exchange. The groups composition was arranged by the course coordinators in order to achieve the highest possible interdisciplinary mix. To further support the acquisition of competence, the VCL project is followed by a phase of individual and group-specific self-reflection.

Assessment. In the follow-up phase, the focus lies on the final assessment of the learners. In this context, not only the contents of the case study solutions were taken into account, but also observations made during the VCL project in the sense of a formative assessment, e.g. on the systematics of the joint approach, collaboration in the group, commitment and role conformity of the participants. The quantitative analysis of the participant's data traces generated on the virtual learning platform during the activity (Learning Analytics) was used to enrich and objectify these rather subjective assessments.

To support the virtual group work several interventions have been implemented, e.g.

- *Role Concept:* The orientation towards different roles for virtual collaboration promotes the independent organisation and planning of learning processes as well as the distribution of tasks between the students during group work (Bukvova, Gilge, & Schoop, 2007). Three different roles were created for this purpose: Team manager, reporter and members. These roles determine the function and responsibility of the participants within the group process. Based on their self-assessment of individual strengths, abilities, work and learning experiences, the participants had to agree democratically on the distribution of roles. The individual roles are characterised by the following requirements:
  - Team managers: control and organisation of group work, preparation of project plans, distribution of tasks, definition of group deadlines
  - Team reporter: preparation of written documentation (protocols, weekly reports), publication of interim results and group results
  - Team member: Working on the joint group solution
- *Group Contract:* Compared to Case 1, the participants had rather strict guidelines as to which points should be included in the group contract. In the Group Contract, the group members agree on which results they are aiming for in the course, whether, for example, they want to achieve the best possible grades or complete the course with the least effort, they also agree on common rules of communication, define the tools to work with, and clarify times when they are available. The group members finally sign the contract to be concluded by consensus and can refer to it in their group work.
- *e-Tutors:* The e-tutors are master students who are qualified in a separate one semester course. The e-tutors were part of the virtual group, but they were not involved in the creation of the assignments. They did not provide feedback on the content of the assignments in sense of right or wrong. Their main focus was on facilitating the acquisition of teamwork competencies.

- *Formative Feedback:* As the module focused on enhancing such teamwork competencies in addition to human resource knowledge, the participants received formative feedback from the e-tutors on their collaboration at group level. Formative criteria were structuring the cooperation, team spirit, decision-making processes and communication among each other. During their daily work with the participants, the e-tutors filled an observation sheet that can be used by the teaching staff to objectify their formative assessment.

3.2 Evaluation of Case Two

The evaluation consisted of 56 written reflections by the students, which were inductively analysed with Mayring's (2014) qualitative content analysis. In total 25 students (64% female) from the winter semester 2017/18 and 31 (77% female) from 2018/2019. The data was analysed using MAXQDA software. The analysis of the data material focused on statements that pinpoint criteria for successful virtual collaboration from the student's point of view. A total of 156 criteria were identified in six main categories. A detailed description of the evaluation can be found in Dörl, Kurz, & Clauss (2019). In the following, the presentation of the results focuses on the two most frequently mentioned codes per main category (see figure 2).

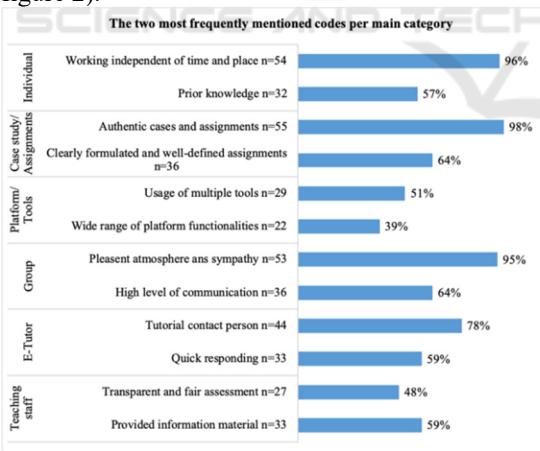

Figure 2: Evaluation of success factors.

Individual. The vast majority, 54 out of 56 (96%) students appreciate *working independent of time and place*. This enables flexibility for the individual through individual work and time management for the independent development of solutions. Bridging distances and independence from fixed attendance times facilitates synchronous and asynchronous communication between group members. This reduces private conversations and promotes the efficient use of time resources. For 32 (57%) students, the *prior knowledge* of the group members is relevant. The knowledge should be homogenous enough to have a mutual understanding for the group work and as heterogenous as possible to facilitate optimal discussion possibilities. This includes previously attended modules, media competence, practical experience and methodological knowledge from the studies. Students primarily mention subject-specific knowledge.

Case Study/Assignments. Authentic case studies and assignments are a success criterion for 55 (98%) of the students. Practice-related, realistic situations create a comprehensible context and a better understanding of the contents presented in the course. They also provide an insight into the course of business processes. For 36 (64%) of the students, clearly formulated and well-defined assignments are an important criterion. However, the participants wish to have less room for interpretation to understand and solve the tasks independently. Furthermore, tasks should be designed in such a way that they can be easily and fairly divided within the group.

Platform/Tools. From the point of view of 29 (51%) participants, *the usage of multiple tools* is particularly important. This can avoid channel reduction, speed up response times and facilitate coordination between group members. Due to the high flexibility, a purpose- and solution-oriented usage can take place. For 22 (39%) students it is important to have *a wide range of platform functionalities* that facilitate communication and organisation of the group. Functions for synchronous and asynchronous communication should be available, which allows archiving of the communication processes.

Group. The majority 53 of the 56 (95%) students consider a *pleasant atmosphere and sympathy* within the group to be particularly important. The prevention of conflicts, understanding of group members and respectful interaction are particularly often mentioned as characteristics of a pleasant group atmosphere. A *high level of communication* within the group is also essential for successful collaboration, 36 (64%) of the 56 students name this criterion. This includes openness, quick reactions, an appropriate tone, adequate organisational arrangements, the active participation of all group members in discussions as well as the quality of the answers. Frustration and conflicts can arise from a lack of communication.

E-Tutor. For 44 (78%) students, a *tutorial contact person* is important for questions about problems which cannot be solved independently or with the help of the group. They provide confidence. The groups work-flow is interrupted by the waiting time for responses. Therefore, 33 (59%) of the students request *quick responding* from their tutors to continue working on the assignments promptly. They should also provide feedback as quickly as possible and intervene if tasks do not meet the requirements or if the achievement of learning objectives is at risk. The main focus is on content-related feedback.

Teaching Staff. Twenty-seven (48%) students emphasise the transparent and fair assessment. Group members should be assessed as objectively as possible according to their qualitative contribution. The assessment criteria must be clearly communicated in order to make the assessment comprehensible to all participants. Furthermore, 33 of the 56 (59%) participants consider the provided information material, such as available e-lectures and recommended specialist literature, as an important criterion.

4 FRAMEWORK FOR VCL

With regard to both presented VCL scenarios, design principles for a successful implementation of virtual group learning can be postulated, based on best practices observed by the educators. A distinction is made between design dimensions on the macro level and the micro level.

4.1 Macro Level of VCL-planning

The macro level reflects the field of institutional planning. University collaborations are embedded in an organizational framework, e.g. study programs, study modules or courses, whose framework conditions strongly influence the design of VCL scenarios. Therefore, the following dimensions for the conception of VCL scenarios on the macro level must be analysed.

- *Curriculum* determines how the VCL should be integrated into the regular study program. The curricular conditions, especally course objectives and module descriptions (qualification objectives, course contents, ECTS, Workload) must therefore be in conformity with the planned scenario.
- Study groups reflect different *cultural characteristics*, with respect to nationalities, higher education culture and subject culture. Cultural differences can be understood as a resource, as they promote diversity, but they also harbor potential for conflict, if different demands for the teaching methods collide.
- The *technology* defines the technological framework with which university collaborations can be implemented via VCL. In addition to a good Internet connection, these include available hardware and software, as well as the physical nature of rooms for teaching and/or group work. In addition to "hard" technical facts, data protection regulations and privacy guidelines of all participating universities are to be examined in order to clarify which social media tools and analytics tools can be used and in which form the permission of the students for the analysis and evaluation of their data is necessary.

4.2 Micro Level of VCL-planning

The micro level describes the conditions for successful implementation of VCL scenarios in pedagogical and organizational terms, by focusing on the teaching and learning processes.

A basic prerequisite for the success of the cross-university virtual group work is the accompaniment by *e-tutors*. E-tutors are the link between learners and teachers and are prepared for the specific needs of online group work. In particular, the availability of one concrete contact person was emphasised in cross-university settings. Inconsistent statements and information asymmetries between lecturers of participating institutions were intercepted by the e-tutors as an intermediate level and could be cleared up before they reached the groups. In addition to the communicative support, the media-didactic assistance issued by the e-tutors was appreciated. The e-tutors gave helpful advices on which online tools are most suitable for which tasks and were available in case of technical difficulties. For this reason, the need for e-tutors should be recognized at an early stage and recruited and qualified as part of the preparation process. In addition, it is advisable to involve the e-tutors directly in the design of the learning arrangement.

The *learning objectives and evaluation criteria* of virtual group work must be defined between the parties involved and communicated to the students. Already agreeing on common learning goals is challenging because courses are usually embedded in study modules, whose qualification objectives often differ significantly. The adaptation of module

descriptions and the examination types specified therein requires a longer preparation time and are only possible within certain deadlines. As a result, cross-university modules may have the same amount of ECTS credits but require different examination types as defined in the module description. These differences are an obstacle, as they were perceived as unfair within the groups and, in the opinion of the participants, had a negative impact on the motivation of the group members. It is recommended that the examination types are as close as possible to each other so that a formative assessment is possible for all involved institutions. The evaluation of group work must be oriented towards the learning objectives and thus be consistent and transparent for all participants. The students have to know the requirements for the VCL outcome (product) and for the VCL procedure (process) in advance.

The selection of *topic and assignments*, which are relevant and interesting for the students is the core of VCL scenarios. The topics must be practical, realistic and realizable, and focused on the future working field of students. The creation of authentic case studies (case 2) requires a reorientation of the focus from scientific work to practice-relevant actions. If a fictional case company is used (case 2), the company created should be adapted to the desired output of the participants. For example, case study companies with modern, flatter hierarchies are more suitable to achieve innovative, creative results, while classic, rigid hierarchies in large companies are more suitable to generate change management approaches.

The implementation of VCL requires the strong *engagement* of the students on different levels. On one hand, they have to achieve the best possible result (learning outcome). On the other hand, VCL also requires strong involvement in the group work process, for example, by assuming responsibility for special tasks (e.g. coordination, documentation). The use of game elements may help strengthen students' engagements (Fischer & Heinz, 2018; Fischer, Heinz, Schlenker, Münster, & Köhler, 2016). Within case 1 a scoring system was introduced for the evaluation of group work, and the project presentation was embedded in a competitive framework (pitch) in which the students had to present and explain their project.

The students have to practice the interaction in virtual group work to succeed. Assistance and clearly communicated requirements are just as necessary as regular *fromative feedback*. In both VCL projects, several milestones were defined for students to submit the interim results of their work and then receive qualified feedback from the tutors. In case 1, the primary focus was on providing feedback on the content, while in case 2, the focus was on the acquisition of competencies for teamwork.

Learning Analytics facilitate formative feedback. A meaningful assessment of learning processes and learning outcomes for virtual settings should be enhanced by "hard", fixed, automatically measurable, quantitative indicators. These can only be analysed on predefined platforms that offer a gateway to analyse these data (see case 2). For Learning Analytics meaningful data on user activities and interactions with learning content as well as between learners in the virtual room must be identified, recorded, processed and made available in an understandable form based on digital traces relevant to learning objectives and expected learning outcomes. The visualization of learning analytics data can help to improve the overview of the group performance of e-tutors. This allows to enlarge the e-tutors' span of supervision. The analysed data can also be used to develop gamification elements as ad-hoc feedback for learners in order to achieve a stronger learner-centred and automated approach for engagement-enhancing measures.

The following framework (see figure 3) summarizes the design dimensions of the micro and macro levels.

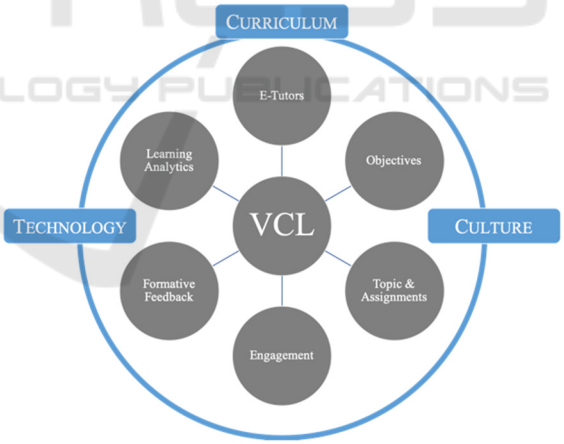

Figure 3: Design dimensions for the implementation of VCL-Scenarios.

4.3 Lessons Learned and Design Recommendations for VCL-planning

At this point, selected main findings are compiled and further concrete design measures for the implementation of cross-university cooperation are derived.

Consensus Aggregation of Learning Objectives. When designing learning objectives, different focuses should be considered in the early planning process of complex teaching-learning arrangements, especially in the case of cross-university arrangements. For example, Universities of Applied Sciences tend to focus on concrete learning outcomes with a close practical orientation, while full universities focus on more abstract, generalised knowledge. In the planning process and in the process of preparing the case study, these differences repeatedly became apparent and were discussed in a consensus-oriented form. As a compromise, the subtasks of the case study were each designed in such a way that they showed increasing degrees of freedom and complexity in the solution design while applied in practical context.

The cooperative preparation of case studies with different learning objectives leads to an increased need for coordination, which has to be considered in the planning process. Therefore, an early start with sufficient preparation time is a crucial criterion for case study design.

Independent Work as Learning Objective. Some of the participants described personal insecurities due to the open character of their assignments. Independent work should be clearly formulated as an assignment and the development of media competence should be emphasised as an explicit learning objective. In addition, methodological e-lectures should be made available in which the "do's and don't's" of project management as well as assistance for a task-specific social media tool selection are prepared.

Content Related Feedback. The evaluations revealed that participants requested feedback on the content of their work directly after finishing the different assignments. Since e-tutors do not necessarily have to have expertise in the respective subject area, detailed sample solutions should be created. In order to enhance the feedback quality, the following measures should be taken:

- *Extending Support:* Support should be extended by the role of a subject-specific expert. E-tutors collect content related questions and pass these on to the subject experts in regular intervals. To facilitate coordination, communication channels and responsibilities should be coordinated in consensus. An organisational chart should be generated to clarify the responsibilities for the individual question types and clarify the responsibilities of the e-tutors.
- *Extension of the Sample Solution and Development of a Content FAQ:* Based on frequently asked questions, a content FAQ should be created, which could be provided for future e-tutors. It is also advisable to adapt the level of detail of sample solutions to the needs of non-specialists. These steps facilitate faster response times to content related questions.
- *(Online) Expert Consultations:* In order to offer content related feedback and the opportunity for subject-specific questions to the groups after completion of the respective work assignments, the subject experts should provide slots for synchronous (online or in person) consultations after completion of the respective assignments.

Evaluation for Further Development. The retrieved evaluations showed a wide range of suggestions for further development, especially regarding the organisation of the cooperation, the case study material the assignments as well as technical aspects. The high adaptability and creativity of the suggestions for improvement in terms of content were very helpful. Evaluations offer the opportunity to receive insight to the needs and difficulties of the students. They are essential for the continuity of cooperation. They significantly facilitate the identification of improvement potentials and the best possible design for improvement. Both quantitative and qualitative evaluations are an important component in the design of virtual collaborations. Not only students, but also e-tutors and the teaching staff should be involved.

5 CONCLUSION

This article demonstrates the potential of VCL in cross-university collaboration. On the one hand, the paper shows how to decrease university boundaries, on the other hand, how modern collaboration skills, which are crucial for working in a digital environment, can be conveyed to students. However, it also becomes clear that the design of VCL scenarios is a complex task. The evaluations show design measures that facilitated successful cross-university collaborative group work on different levels. On the macro level the success of such teaching formats depends on the individual institutional conditions (curriculum, equipment and culture) of the partners involved. In addition, successful cross-university VCL concepts are characterized on the micro level by the e-tutorial support of the group work, transparent learning objectives and evaluation criteria, the selection of relevant, realistic and job related topics and assignments, the intensive participation of the learners, formative feedback and learning analytics.

Based on lessons learned during the cross-university online collaborations concrete design measures for the implementation of VCL programs are derived. Concrete design advices for the consensus aggregation of learning objectives, the communication of independent work as learning objective, content related feedback and the evaluation for further development are presented.

The framework presented as well as the lessons learned and design recommendations derived from them can provide targeted support for the planning of collaborative online blended learning arrangements. They should be understood as recommendations and give guidance in the sense of best practices. They should be flexibly adapted in view of existing framework conditions.

Especially in the application of learning analytics and the use of gamification measures there is a clear research potential. It should be analysed how a learner-centred support of learning processes and the engagement of the learners can be supported by automated analysis of data.

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