Technische Universität Dresden – Fakultät Informatik
Professur Multimediatechnik, Privat-Dozentur Angewandte Informatik

Prof. Dr.-Ing. Klaus Meißner
PD Dr.-Ing. habil. Martin Engelien
(Hrsg.)

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geneme@mail-mmt.inf.tu-dresden.de

D.3 Virtual Collaboration in Higher Education Blended Learning Arrangements

Helena Bukvova, Steffen Gilge, Eric Schoop
Technische Universität Dresden, Lehrstuhl für Wirtschaftsinformatik, insb. Informationsmanagement

1. Introduction

It is acknowledged that Europe's citizens might presently be among the best educated in the world. But expressing at the same time that without reasonable actions this status can most probably not be sustained in the long run due to continual structural changes, the Education Council of the European Union points out to the European Council, that a continued investment into the education of the people is the critical success factor for Europe's place in the global knowledge economy and a major building block of the Lisbon Strategy (further reading European Council 2000). Furthermore the European education and training system has to encourage the personal growth of European citizens in three aspects (cf. European Council 2001, pp. 5):

a) Skills – currently needed technical, social and personal competencies, giving an individual a secure foundation for life and enabling him to work together in groups with specialists from other disciplines, intelligently using existing Information and Communication Technologies (ICT),
b) Adaptability – the ability to learn about and adjust to new situations, while staying independent and respecting others, and
c) Mobility – the skills required in today's international and multicultural society, especially the ability to work and communicate with others across national boundaries and by this to adapt to the challenges of a global economy.

In Europe's higher education area, the ERASMUS[1] scheme (part of the Socrates II[2] programme) has been introduced as a measure to support this Lisbon Strategy. It aims to enable the geographical mobility of higher education students and teaching staff within EU member states. While the student mobility especially shall foster the individual development of the three aspects mentioned above, thus building the fundamentals of an European citizenship, the teaching staff mobility brings the European perspective to the home country of those students unable to participate in student mobility (cf. EC 2002, pp. 3).

[1] ERASMUS stands for "European Community Action Scheme for the Mobility of University Students"
[2] Socrates II is the title of the European Community action programme in the field of education (2000-06)

Honouring the successful implementation of the ERASMUS scheme in the last years, we nevertheless bring forward its underlying economical problem, best to be described as a two-faceted mobility-trap:

1) Due to the limited financial resources of the ERASMUS scheme, not all European students are able to participate in an exchange programme, even if they would like to use the student mobility ***(limited geographical mobility)***.
2) Due to the docents' remaining teaching obligations at their home universities, they cannot deliver complete modules at the guest university in the normal – weekly – frequency ***(limited time mobility)***.

On the one hand, the mobility-trap on the students' side will result in an unequal development, if not everybody can participate in international exchange, thus torpedoing a broad European integration. On the other hand, the mobility-trap on the visiting teaching staff's side realistically leaves only one possibility open: to give a number of lectures en bloc in one or two weeks. But this does not allow for a complete course module of at least three ECTS credit points (about 90 hours of workload), attracting students to integrate it additionally into their curriculum besides their other running courses.

In this paper we suggest a solution to these two problems. A blended learning arrangement is designed with one core element being the virtual collaboration of higher education students from different European countries. By integrating this virtual element into the learning process, we resolve the physical mobility-trap of the ERASMUS scheme outlined above and, additionally, address the requirements on the personal growth of the students in respect to their skills, adaptability and potential mobility.

2. Design of the Blended Learning Arrangement

In the following, the term "learning" shall be understood as the individual process of adapting behaviour to new demands of a changing environment. In order to guide such learning processes into a certain direction, learning arrangements are set up. The term "learning arrangement" refers to the conditions of learning (e.g. time, place, contents, methods, media and social forms used) and describes the intentionally designed situation, in which the learning processes shall take place (cf. Lang et al. 2002, p.46). In the modern constructivist paradigm on the one hand the learner is regarded as an active participant in the learning arrangement, constructing his individual knowledge by integrating the new experiences into the already existing knowledge. On the other hand a situated learning environment is recommended, as similar to the target environment – knowledge application at work – as possible, where learners solve complex (authentic,

real world) problems by interacting with other learners and tutors (cf. Klauser et al. 2004, pp.7).

The term “electronic Learning” or “eLearning” refers to a learning arrangement, in which modern Information and Communication Technologies (ICT) are used as a means to facilitate the learning processes. We distinguish between self-guided individual learning, based on didactically accentuated online learning content to be delivered via the Internet, on the one hand and collaborative learning in small learning groups mainly using the communicative features of modern asynchronous or synchronous ICT on the other hand (Schoop et al. 2005, p. 112). Generally speaking, we do not estimate eLearning as a fundamentally better alternative to other learning arrangements. All special kinds of learning arrangements have their pros and cons. Only a reasonable combination of different types of learning arrangements, which fit to the learning aims in focus, will achieve sustainable learning results. Therefore we prefer to speak of blended learning (bLearning) when we describe the design of learning arrangements which take the learning situation and the potentials of modern ICT into account, integrate selected ICT-tools where possible with established – traditional – learning arrangements and consider both didactical and economical aspects, when arranging a concrete bLearning module.

We follow the recommendations of modern pedagogics as outlined above, when we try to integrate the social form of cooperation into a bLearning module as often as possible. The term “cooperation” is thereby understood as “the task-focussed communication of teams and groups towards a common goal” (Bair 1989, p. 209). James BAIR further divides the cooperative activities into four levels depending on the degree of interaction between the group members (see Figure 1).

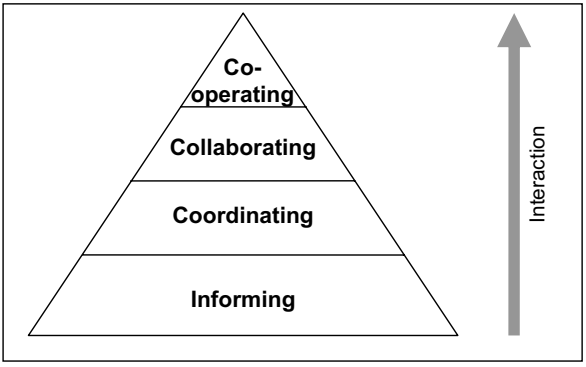

Figure 1: BAIR-pyramid and levels of interaction (cf. Bair 1989, p. 209)

The BAIR-pyramid demonstrates that the higher the level, the more the mutual understanding among group members is necessary and the richer interactions within the group are required (e.g. interactions in the same time and space are at the highest level). Table 1 gives a short list of characteristics of each level of the pyramid.

Level	Characteristics
Informing	• To provide information on a common repository • Sender and receiver are rarely in contact • Sender does not necessarily have to know receiver
Coordinating	• To bring into proper order or relation • No common work goals, although common interests • Some acquaintances, e.g. scheduling of resources
Collaborating	• To work together on common goals as a team • To participate in same process, but unequal involvement likely • Independent individual evaluation
Cooperating	• To work together for common purpose with consensual decisions • Sublimation of individual goals in favour of the team's goal • Common output usually requiring face-to-face interactions • The team is evaluated as a whole

Table 1: The four levels of the BAIR Pyramid (cf. Bair 1989, pp. 209)

For the development of the higher education bLearning module we see as essential that potentially all four levels of the BAIR-pyramid are addressed, since it is important for the students to achieve cooperative skills and by this develop important knowledge for their later jobs. Bearing the limitations of the ERASMUS scheme (mobility-trap) in mind, we suggest the following setup for a 3 ECTS credit points module (see Table 2).

	Phase (Workload)	Forms and Contents of Learning
❶	Information (~5 hours) [Informing]	Website information and kick-off (remote) lecture containing: - organisational announcements, - an introduction to the concept of blended learning, - a presentation of the software to be used and - the definition of essential terms of the domain dealt with.
❷	Self-guided Learning (~20 hours) [Coordinating]	Individual self-guided, self-paced learning using online learning contents provided within 2 weeks. Additionally an Internet based forum can be used for discussing the contents between the students and for posting organisational messages.
❸	Workshop (~35 hours) [Cooperating]	Common solution of the complex problem of a task given in small, self-organised groups, by working out a 5-10 page assignment in face-to-face meetings within 2 weeks. Presentation and discussion of the assignment in an on-site workshop (seminar-style), enriched by lectures systemising

		and deepening special aspects of the domain dealt with and finished off by a tutored business case study workshop within 1 week of on-site teaching.
❹	VCLSession (~30 hours) [Collaborating]	Kick-off lecture for a Virtual Collaborative Learning (VCL) session (see chapter 3) followed by tightly tele-tutored self-organised team work in small groups (4-6 team members), mainly using ICT for solving ill-structured tasks and documenting findings, lasting 3-4 weeks.
	∑ = ~90 hours	∑ = 8-9 weeks (within: 1 week with docent present on-site)

Table 2: Design of the bLearning Arrangement [with Levels of BAIR-Pyramid]

❶ During the first phase of the bLearning arrangement (Informing-Level of the BAIR-pyramid) organisational information about the module and guidelines on how to use the eLearning ICT infrastructure (i.e. a standard LMS – learning management system) are provided for the students. They are required to get acquainted with this information until the kick-off lecture is given, which lasts 90 minutes and contains an introduction to the learning arrangement of the following weeks, an introduction to the topical domain dealt with and to the learning objectives. ❷ In the second phase (Coordinating-Level) the students individually work through the online learning content provided. An internet-based forum supports communication about the content between the students. The students select partners for the groups' tasks following. ❸ The third phase (Cooperating-Level) starts with the provision of a complex assignment that the students in groups of two to three members have to elaborate and document in 10-paged assignments. Then the docent executes an intensive on-site workshop lasting one week with approximately four hours workload per diem. During the first two days the students present their assignments in a seminar. The next day is spent with readings and lectures to systematise and enhance the contents discussed in the seminar. Day 4 consists of cooperative team-work on a business case study. The results have to be finished and turned in during the next day. During this one-week workshop the docent gets to know the students and their abilities for problem-solving and social interaction without the limitations of the virtual room. This knowledge helps to set up the teams and determine the complexity of the tasks for the following phase. ❹ The fourth Phase (Collaborating) completely takes place in the virtual classroom, following the concept of Virtual Collaborative Learning outlined in the next chapter. It starts with a kick-off event related to the topic of the last day of the workshop week. It has to be highlighted that the fourth phase does not primarily address the Cooperating-Level of the BAIR-pyramid due to the restrictions of meta-communication by the virtual classroom. There might be some elements of the VCL that address the Cooperation-Level (e.g. some form of synchronous communication), but it mainly focuses on the Collaborating-Level.

Now, in order to address the mobility-trap outlined at the beginning, it is important to note, that the bLearning module designed here is not intended to be just brought out to one institution of higher education – let's say the home university of the respective docent. The time and space-bridging features of the virtual communication technologies in the fourth phase will be used to make up international teams from different sites with similar prior knowledge. Consequently, the phases ❶-❸ of the bLearning arrangement will have to be provided at two or more ERASMUS partner universities by the teaching staff giving the introductory lecture as tele-lecture and travelling there for the one-week workshop in phase ❸ on ERASMUS teaching staff funding. When setting up the international groups, the docent has to bear in mind that the students from the different sites have not had the opportunity to get to know each other closely. Hence, but not only in this case, the preparation of the virtual phase ❹ needs special and extended attention. This is outlined in the following chapter.

3. VCL in Higher Education Blended Learning Arrangements

As presented above, the idea of cooperative learning is based on the principles of constructivism. The learners in collaborative arrangements – the third level of the BAIR-pyramid – work in small teams to solve a common authentic problem (e.g. complex business case study). By means of intensive communication and interaction, they are able to share their individual skills to the benefit of the whole group (cf. Balász 2004, p. 36). The intensive interaction essential for collaborative learning demands high requirements from all participants, as they have to be able to communicate and meet regularly. The virtual enhancement of collaborative learning permits the learners to participate despite time and place differences, as they are provided with tools for synchronous as well as asynchronous communication.

The following sections are based on our experience from the research conducted together with national and international partners. Since 2001 the total of 18 VCL projects has been performed in different settings (see Figure). These settings can be classified by the geographic location of the participants (disjunct or conjunct) and the target learner group (higher education or lifelong learners). The learners in all settings were supported by standard learning management systems, which provided tools for asynchronous and synchronous communication and project management.

The VCL setting has continually been varied and refined in order to achieve higher motivation of the participants and to improve the effectiveness and efficiency of the learning processes. The following sections present the latest design of three key elements of the VCL framework: tasks, roles and assessment.

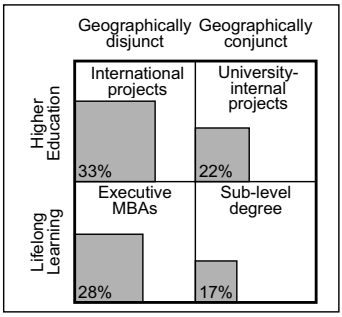

Figure 2: Performed VCL projects in different settings

3.1 Tasks

In order to achieve the sustainable effects of collaborative learning, the participating groups have to be more than learning communities with similar interests (Coordinating-Level). It is necessary, that all group members strive for a common goal, which they can only achieve by working together. Hence, the task assigned to the participants serves as a trigger of a VCL project and plays a key role in the motivation of the participants.

Because of its importance, the VCL tasks have to be carefully planned. Each task has to fulfil the following requirements (cf. Balász 2004, pp. 63; cf. Reinmann-Rothmeier et al. 2001, pp. 627):

- **Fuzziness**

  The learners have to be presented with a problem that appears unclear and ill-structured. The problem needs to be analysed by the learners in order to determine actual tasks and solution procedures. At the same time, there has to be neither a unique solution procedure nor a single correct answer to the problem.

- **Reality**

  The problem has to be based on a realistic scenario, preferably in a context, that is new to the learners. Thus, the learners are required to adapt and transfer their knowledge into an authentic, possibly unfamiliar context. Further, using a genuine scenario ensures that the learners will be confronted with natural complexity of real world problems.

- **Complexity**

  When creating the task, it has to be taken into account that it has to motivate a small team (four to six learners) to intensive interaction. Hence, the problem has to encourage the learners to view the scenarios from different perspectives. Further, the complexity of the problem has to ensure, that the learners cannot solve the task

individually but rather need to communicate and closely collaborate with the other participants.

The VCL task can occur on different levels, targeting various groups of participants. The problem can call for a solution on the individual level, group level or even the session level (see Figure).

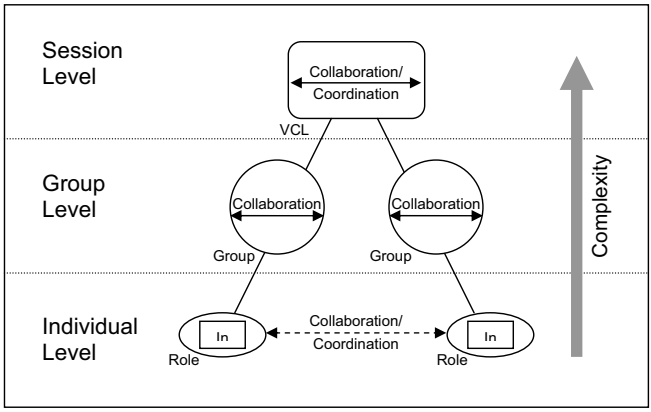

Figure 3: Different task levels of a VCL session

The complexity of the problem has to be increased significantly between the individual and the session level:

- **Individual level**
  On this level, the individual participants are in focus. They receive tasks (preferably in compliance with their roles) that they have to fulfil on their own. The complexity of individual tasks can be increased by encouraging the learners to interact. Such interaction can occur on the coordination level (e.g. exchange of ideas) as well as on the collaboration level of the BAIR pyramid. The results of the individual tasks then have to be carried into the groups and support the solution of group tasks.
- **Group level**
  Tasks on the group level are of higher complexity as they have to engage and encourage a group of learners to collaborate. It has to be ensured (in contrast to the individual tasks), that the group tasks can only be mastered by means of intensive communication and cooperation.
- **Session level**
  A task on the session level demands, that all groups participate to solve a common problem. The results of their group tasks are a part of the session problem solution, however interaction on at least coordination or even collaboration level is necessary

to adapt the group result to the session task. The complexity of the task has to be the highest on this level, as the groups have to be animated to re-evaluate and adjust their already existing results.

A VCL project needs not necessarily include tasks on all levels. The foundation is a group level task. This type of task is necessary to trigger collaborative learning in the group and is thus the core of a VCL project. According to our research, including tasks on individual level helps to profile the individuals (preferably on the basis of their roles) and thus controllably increase the heterogeneity of the group. Individual tasks also support the later individual assessment (see section 3.3). Session level tasks increase the complexity of the whole VCL setting. They can therefore be used to provide additional challenge to more experienced VCL participants.

3.2 Roles

It could be observed, that in the beginning of each VCL project the learners go through an "orientation phase". Particularly if the participants do not know each other, they first have to find their position within the group and adapt the tasks they assign to this position. According to personal characteristics and previous experience, the learners then perform a certain *role* within the group.

In order to help the learners with the orientation in the VCL setting and within the groups, the participants can be assigned predefined roles by the tutor before the session. Alternatively, they can be allowed to choose from a set of roles themselves, however in a very short period of time. The roles describe the function of the individuals and name their responsibilities in the VCL, thus giving them a basis for their activities in the session. By assigning one individual different roles in diverse VCL sessions, he has the opportunity to adopt several perspectives and improve different skills.

The heterogeneity of the group has a significant influence on the learning process. While a certain level of heterogeneity can be supportive in the learning process, because the individuals are confronted with different opinions and new knowledge, greater differences can hinder the interaction and thus the progress of the group (cf. Balász 2004, pp. 36). By prescribing roles within the group, the level of heterogeneity can be controlled, because the aim of the learner is limited to the function prescribed.

The role concept also has a strong influence on the coherence of the group. Without a clear distribution of functions an asymmetric division of labour could take place within the group, leading to unbalanced workload among the group members. Further, the participants could divide the tasks in such way, that only a minimal coordination effort is necessary, thus jeopardising the intended learning effect. Distributing roles can ensure that the group members depend on each other. Each role describes a set of activities for

which the role-bearing individual is responsible and to which he/she is limited. However, in order to solve the VCL problem, all activities of all roles are necessary. The participants therefore have to collaborate.

The roles used in our research based VCL projects can be divided into two groups:

- **Expertise oriented**
  This type of roles is based on expertise in a particular area related to the VCL task. The learner in this type of role has to support the group with particular knowledge (e.g. as a finance expert with special knowledge of finance) or skills (e.g. as a media expert responsible for the design of media objects). The individuals either already possess the necessary knowledge and skill or they can be asked to acquire them as a part of their role-based responsibilities.
- **Activity oriented**
  Roles of this type describe a set of activities that the learner is expected to carry out throughout the session (e.g. project manager, researcher, critic, protocol writer). Activity oriented roles are independent of the VCL tasks. The learners therefore need task-related knowledge and skills in addition to the skills demanded by their role-based function.

The role types can be freely combined. According to our experience, however, the role of a *project manager* is always necessary. Due to the complexity of the VCL tasks, coordination of the participants and time management play an essential role. In order to simplify the assessment of the VCL sessions and support the project management, the participants also need to protocol their progress, particularly before and after synchronous communication, which tends to be unstructured and difficult to recall. The role of a *protocol writer* is therefore also important.

When planning and describing the roles, it is necessary to consider the VCL task, as the choice of roles depends closely on the problem the participants are expected to solve. Further, the background of the participants has to be taken into account, because the learners will need specific knowledge and skills in order to perform the roles.

Interaction among the groups either on the individual level or on the session level serves to enrich the VCL session and to prevent isolation of the groups. However, particularly session level tasks also increase the complexity and the demands on the session management. It is a very challenging task to control the interaction of more than twenty individuals (mostly split up in groups with 4-6 members). Encouraging exchange among participants who perform equivalent roles, helps to limit the complexity, while it still allows intensive interaction. These participants can discuss and collaborate in small role-based clusters and then carry the common result back into their different groups.

Prescribing pre-defined roles also influences the later assessment of the session. Because the individuals are only responsible for a clearly defined set of duties, the evaluation of their participation can be based on their performance of these duties.

3.3 Assessment

A last and very important question is the assessment of a VCL project, since at least in higher education an individual assessment of the students participating is obligatory and, from the experiences not only with virtual learning arrangements, the assessment plays a big role for the (extrinsic) motivation of the students. We have therefore gradually refined our assessment scheme and developed an assessment process in three steps (see Figure 4; 1,0 equals very good, 5,0 - failed).

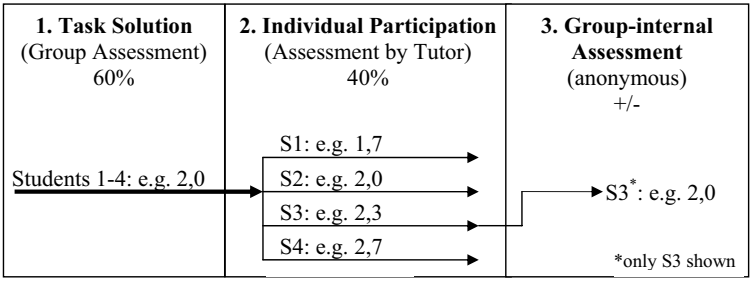

Figure 4: Assessment of a VCL session

In the first step the assessment focuses on the quality of the assignment handed in. Factors like formal quality (grammar, structuring), content (correctness, completeness, integrity) and the consistency of the arguments is assessed. In the second step the tutor is assigning marks to the individual student by assessing his participation, like taking part in discussions and supporting the group work. The mark composed out of these two parts can, in the third step, be changed by a full mark through an anonymous poll within the groups, in which the students assess the work of their fellow group members.

4. Conclusion

Interactive cooperation and collaboration in teams play a key role in modern learning processes. Our deliberately designed and repeatedly refined VCL projects, based upon 5 years of practice and empirical research, address this demand. They are the core element of our higher education blended learning arrangement.

By the transfer of the collaborative work into the virtual classroom, our blended learning arrangement can – and is regularly – be used to integrate several international partners, thus forming bi- and tri-national students' teams performing common tasks

based on complex, ill-structured problems. Furthermore, our outlined blended learning solution allows students and docents in the ERASMUS context to escape the current (geographical, financial and time-related) mobility trap. A first run of our so called *mobile* ERASMUS *module* in the summer semester of 2006 successfully integrated courses in Szczecin/PL and in Dresden, and proved the solution as principally performant, being both effective (regarding the students' achievements) and highly acceptable (evaluated students' opinion).

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