

# Using E-Portfolios as an Assessment Instrument within the Study-Programme “Problem-Solving Competencies”

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## Abstract

This paper describes how the extra-curricular project activities of students in informal communities of practice can be embedded into the formal curriculum of higher education via e-portfolios. First we introduce the context of our case study and outline the didactic concept of a study programme that aims at fostering key competencies. We then go on to explain the purpose of the portfolio approach within this study programme. We present the software tool "e<sup>3</sup>-portfolio" and illustrate its application by a brief user scenario. Afterwards we argue how our portfolio approach combines reflection on experience and the assessment of learning. We show how we scaffold the student's reflection process, how we assess the extra-curricular activities in the project groups and explain the assessment criteria and feedback processes that are employed.

## 1. Study programme “Problem-Solving Competencies”

At the University of Augsburg the study programme “Problem-Solving Competencies” embeds the extra-curricular project activities of students (e.g. engaging in a campus radio or TV, creating websites, blogs and podcasts<sup>1</sup>) into the university curriculum. In the course of the study programme students participate in these project groups and develop key competencies through collaborative problem-solving. When attending the study programme there are two modes of participating: In the first mode, a certificate of the university can be obtained which formally attests the student's extra-curricular engagement. This certificate helps prospective employers to get an idea of the candidate's competencies and practice experiences. In the second mode, the activities in the projects can get accredited as credit points in the students' bachelor / master programme. In either mode, students who want to

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<sup>1</sup> An overview of all current projects can be found here: <http://begleitstudium.imb-uni-augsburg.de/community>

take part in this programme join a project group they are interested in and register as participants of this group through the university's learning management system. The engagement in the project groups, however, is completely voluntary and it is possible to participate in the projects without attending the study programme.

### **1.1 Learning by participating in communities of practice**

The project groups can be considered as communities of practice from a didactical point of view. Students who participate in them engage in “a domain of knowledge, which defines a set of issues, a community of people who care about this domain, and the shared practice that they are developing to be effective in their domain” (Wenger, McDermott and Snyder, 2002, p. 27). By participating in the self-organised project groups students develop a broad range of key competencies. They do this by gradually acquiring the skills and knowledge which are needed to be a full member of the community and to perform the activities related to the community's practice. As the students take on more responsibility over the course of several semesters they form attitudes corresponding to their roles in the project (cf. Dürnberger & Sporer, in press). For instance they start to act like an “editor-in-chief”.

Project participants who decide to attend our non-mandatory study programme have to cover three modules that focus on practical, social and scientific problem-solving (Sporer, Jenert, Reinmann & Hofhues, 2007):

- In the module *practical problem-solving* students create products and deliver services that are of value for third parties. The products and services they create address realistic problem situations and aim at mastering concrete and authentic challenges. This module frames the student's activities in the projects towards the acquisition of entrepreneurial competencies (cf. Erpenbeck & von Rosenstiel, 2007). It emphasises the practice-oriented element of a community of practice.
- The module *social problem-solving* deals with the acquisition of strategies which are of importance for cooperating with others. Knowledge, skills and experiences should be shared with fellow students. This involves managing a project group, taking over tutorial functions in the communities or helping to solve conflicts that arise from the project work. This module frames the student's project activities towards the acquisition of social-communicative competencies (cf. Erpenbeck & von Rosenstiel, 2007). It emphasises the community-oriented element of a community of practice.

- The module *scientific problem-solving* allows students to engage in research activities that take place not only in the theoretical context of their studies but also in practical fields. Students gain experience in the design of empirical surveys, the collection of data, as well as the analysis and interpretation of the data. This module frames the student's activities in the projects towards the acquisition of professional competencies (cf. Erpenbeck & von Rosenstiel, 2007). It emphasises the domain-oriented element of a community of practice.

Depending on the number and diversity of roles and tasks a student embraces, all three modules can either be completed in several different projects or in a single one. The certificate states in which projects the student participated in and what tasks were taken on, whereas the credit points for the official academic record must relate to the learning goals of the bachelor / master programme and have to be assessed by the faculty.

## 1.2 Learning by reflection about personal competency development

To design effective learning environments it is necessary to constructively align the intended learning outcome with the learning activities and the assessment methods (Biggs, 2003). As the learning activities in our study programme take place in an extra-curricular context the assessment methods we employ should not interfere with the goals of the project groups. Because it would undermine the self-organisation of the communities of practice it is important not to take external influence on these project groups through our study programme. Therefore the modules of our study programme organise the learning activities in the project groups. The corresponding learning outcomes are entrepreneurial, professional and social communicative competencies.

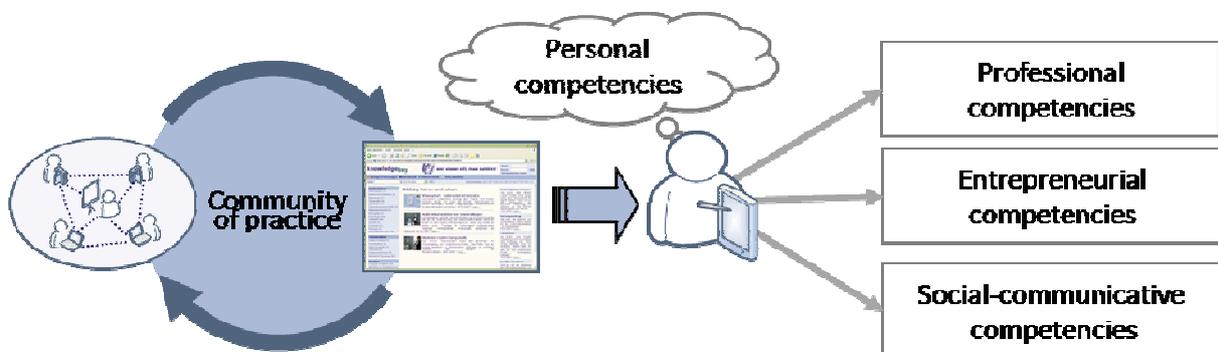


Figure 1: Development of personal competencies via the reflection of experience

In order to make the students more aware of their learning achievements, our assessment method is based on the reflection of the experiences in the projects. By articulating the competencies that were tacitly acquired in the communities of practice, we want students to engage in the construction of meaning and sense-making in the tradition of Dewey (1938). This emphasises the identity-oriented effects of the participation in a community of practice and promotes the development of personal competencies (cf. Erpenbeck & von Rosenstiel, 2007). It aims at intentional learning in which the purpose of the problem-solving shifts from the activity at hand towards building capabilities towards future situations. Learning *through* problem-solving which refers to activities and tasks that are directed towards immediate goals should transform to learning *as* problem-solving which "is dedicated to more long-term goals of competence and understanding" (Bereiter & Scardamelia, 1989, p. 366).

An assessment strategy which fits these goals of our study programme needs (a) to support the communities of practice in their self-organised project work, (b) to facilitate the students' competency development through reflection on their learning processes and (c) to bridge the formal requirements of a study programme with the informal character of the extra-curricular learning context. As portfolios focus specifically on the reflection of student's learning experiences and the illustration of their competency development (Häcker, 2005), they provide a suitable assessment instrument to meet the requirements mentioned above.

However, according to Barret and Willkerson (2004) it is important to distinguish two functions of assessment in the context of e-portfolios: The first is the assessment *of* the student's learning outcomes whose purpose is to test if students have reached the intended learning goals and to accredit their achievements. It typically takes place at the end of the learning process and is therefore called summative assessment. The second is the assessment *for* learning which is designed to support student's learning processes by providing feedback on their performance in regards to the learning goals (Knight & Yorke, 2003). In our study programme we try to combine the two in a blended assessment strategy (cf. Reinmann, Sporer & Vohle, 2007).

## **2. Didactic rationale for the portfolio-based assessment**

The portfolio-based assessment strategy employed in our study programme blends the didactic function of scaffolding the student's reflection of experience (assessment *for*

learning) with the accreditation of the student's learning and working achievements in the formal curriculum (assessment *of* learning). It builds on three kinds of portfolios suggested by Barret and Wilkerson (2004): a working-portfolio, a story-portfolio and a test-portfolio. During the implementation of our portfolio approach these conceptual terms have been renamed to better fit the understanding of the students.

## 2.1 Project journal: scaffolding reflection-in-action

By collecting artefacts of their work in a digital repository students document their working activities as *project results* (working-portfolio). These project results as well as the student's learning process are then reflected upon via a blog-based *project journal*. In this project journal students reflect on the salient events in their projects and track the workload they put into the projects. About once a week they take the time to write down what happened in their projects and how they evaluate the course of the project work. This reflective process is scaffolded with guiding questions that were derived from Jones & Shelton (2006):

| Time(span)   | Objective Events / Activities  | Subjective Impressions / Evaluations  |
|--|--|---|
| <i>01.04.09</i><br><i>until</i><br><i>07.04.09</i> | <p><b>Step 1: Description of situation</b></p> <ul style="list-style-type: none"> <li>• What events have happened since the last journal entry (meetings, artefacts of work, etc.)?</li> <li>• When and where did these events take place and what are their results for the project?</li> <li>• Who participated in the events and what role did they take on in the project group?</li> </ul> <p><b>Step 4: Projections and planning</b></p> <ul style="list-style-type: none"> <li>• Which future tasks and goals have been agreed upon and were coordinated between the group members?</li> <li>• How do I assess the implications of these plannings for the prospective course of the project?</li> <li>• What further changes do I want to achieve with respect to future work within the project?</li> </ul> | <p><b>Step 2: Analysis und interpretation</b></p> <ul style="list-style-type: none"> <li>• What are my thoughts and feelings regarding the current situation of the work in the project?</li> <li>• How do I evaluate this situation and the previous course of action in the project?</li> <li>• Which opinions, premises, expectations influence my evaluation?</li> </ul> <p><b>Step 3: Insights und implications</b></p> <ul style="list-style-type: none"> <li>• What chances and problems do I expect for the next steps in the project work?</li> <li>• How do the events affect my motivation and the atmosphere in the project group?</li> <li>• What are the consequences that I infer from my reflection on the current situation in the project?</li> </ul> |

Table 1: Scaffolding reflection-in-action through the project journal

The four steps of the reflective process illustrated in table 1 instruct students to reflect-in-action (Schön, 1987). They aim at teaching students to think about their experiences within the project in a systematic way. Students learn to separate the events that occur in the project from their subjective impressions, learn how to evaluate the events from their personal point of view and to consciously decide about the future course of action. At the end of the semester the project journal and the work results are handed in to the faculty. Both serve to approve the workload in the project groups during the semester and get assigned to the respective modules of the study programme.

## 2.2 Project report: scaffolding reflection-on-action

In addition to the project journal students can reconstruct their reflective writings into a narrative in which they look back on their activities within the project groups (story-portfolio). In an introductory part of this narrative students state their motivation and describe the context of the project. In the middle part selected entries from the project journal are revised into a coherent learning history which shows what the student has done during his participation in the project and how the necessary competencies to participate in the project were acquired. In the concluding part the student arguments how the competency development manifests in the project work and how the work in the project relates to the modules of the study programme. This narrative is finally assigned to the three modules of practical, social and scientific problem solving and can be handed in as a *project report* in order to earn credit points for their bachelor / master studies (test-portfolio).

|   |
|---|
| Part A: Background of the project and personal motivation   |
| <p>Introduce the project in which you take part and point out:</p> <ul style="list-style-type: none"> <li>• In which project group you completed which building block of the study programme?</li> <li>• What are the aims of this project group and how do they relate to your personal goals?</li> <li>• What is the reason for you to join this project group?</li> <li>• What tasks have you taken up during your participation in the project group?</li> <li>• How and what did you contribute to the aims of the project group?</li> </ul>   |
| Part B: Course of the project work as a learning history  |
| <p>Give a chronological overview of your activities in the project and point out:</p> <ul style="list-style-type: none"> <li>• How did you find your place in the project group and what role did you play?</li> <li>• How have you acquired the competencies that you needed to participate in the project?</li> <li>• How did you overcome the difficulties that you encountered in your project work?</li> <li>• Which social conflicts occurred within the project group and how where they resolved?</li> <li>• How have you shared your knowledge about the project with other members of the group?</li> <li>• What has changed with regard to your personal motivation since you first started the project?</li> <li>• To what extent has your perception of the aims and contents of the project transformed?</li> </ul> |
| Part C: Resumee of the project work and personal evaluation   |
| Summarize your experiences in the project group and point out in your personal evaluation:  |

- |   |
|---|
| <ul style="list-style-type: none"> <li>• Which competencies have you acquired in the area of practical/social/scientific problem-solving?</li> <li>• How can your competency development described by using episodes from the learning history outlined above?</li> <li>• How can you apply the competencies you acquired in contexts outside of the study programme?</li> <li>• Which competencies do you want to develop further when you think about your experiences from the project?</li> <li>• What is the meaning of the experiences in the project for the future course of your academic education?</li> <li>• To what extent has participation in the project helped you to orient yourself in regards to your future working life?</li> </ul> |
|---|

Table 2: Scaffolding reflection-on-action through the project report

In contrast to the reflection in their project journal, students take into account a longer period of time when reflecting in the project report. The guiding questions illustrated in table 2 aim at scaffolding reflection-on-action (Schön, 1987). They were developed based on a model of the reflection process described by Boud, Keogh and Walker (1985). The students return to the reflections of their experiences collected in the project journal, attend to the emotions documented in the entries of this diary, construct a coherent story of their participation in the project and finally evaluate the meaning of this reconstruction of their experience. By writing such a retrospective narrative, students build metacognitive knowledge about their own learning process (cf. Bruner, 1990).

### 3. Using the open source software tool “e<sup>3</sup>-portfolio”

The portfolio tool we employ in our study programme integrates three different realms which are intertwined with each other via the previously outlined assessment strategy – hence the name “e<sup>3</sup>-portfolio” (cf. Sporer, Jenert, Meyer & Metscher, 2008). The software was customised to fit the programme’s didactic concept as well as its organisational structure: a) it makes use of various features for online collaboration and allows users to organise themselves in groups, b) it helps students to create their project journals, c) it structures the assessment process of the student’s learning achievements and their accreditation in the curriculum.

#### 3.1 Supporting the assessment process through e<sup>3</sup>-portfolio

The *community space* gives an overview of the project groups including information about the goals and purpose of the community, the activities and responsibilities students can take on when participating as well as the competencies that can be acquired when engaging in the

project. Students interested in a particular project can join the group's community space or set up a space for building a new project initiative. All members of such a community have access to the project group's internal space which provides tools for project and knowledge management (community blogs, project wikis, etc.).

In the *portfolio space* participants of the programme can create a personal webpage with information about their goals, competencies and interests. In addition, this space allows students to collect evidence for their learning achievements in form of personal reflections and enrich them with the contributions to their project groups in the community space (community blog, project wiki) and the project results that were achieved (articles, podcasts) by using the blog-based project journal.

At the end of a semester students can submit their project journal to the faculty via the *assessment space* where all learning achievements in the context of the study programme are organised. Students who want their efforts in the project groups to be accredited in their bachelor / master studies can submit their project reports to the faculty who then review them.

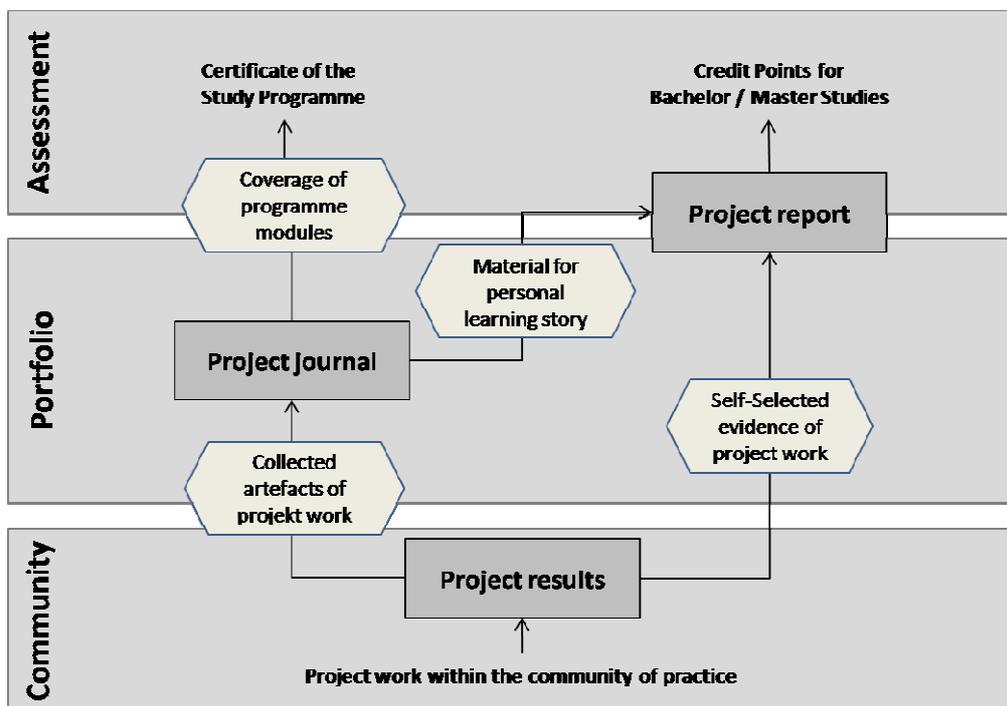


Figure 2: Structure of the portfolio tool in relation to the assessment strategy

This outlined structure of the portfolio tool we employ for the study programme is illustrated in figure 2. It is explained below through a fictional user scenario.

### **3.2 Example of using e<sup>3</sup>-portfolio in form of a brief scenario**

A student in her second semester at university starts to participate in a project group that is producing a TV programme about campus life. She joins the group and gradually grows into the community of practice. In her first semester in this group she is introduced to the process of producing the programme. Each step of her learning process is reflected upon in the student's project journal in the portfolio space. Besides these reflections on the project work and her learning activities, other documents like the storyboard, the interviews and the progressive versions of the final product are uploaded as project results in the community space where other students can give feedback and comment on her artefacts.

Having learned the necessary knowledge and skills to be a full member of the community of practice, she continues to participate in the project group for another two semesters. Since she is now familiar with the practice of the community and the relevant tasks to manage the project group she takes on the role of the "editor-in-chief". After two semesters of taking responsibility for the group she decides that she now needs to concentrate on her master's thesis. Therefore she helps a successor to take over her role as an editor, documents her lessons learned in the wiki of her community and gradually withdraws from being actively involved in the project.

After three semesters of participating in the project group and continuous reflection in her project journal, she covered the all three modules of the study programme. She receives a certificate that confirms her engagement in the project group and describes the competencies she has acquired by performing different roles and responsibilities in the community of practice. Additionally, she writes a final project report which she hands in via the assessment space of e<sup>3</sup>-portfolio. Afterwards the report is assessed by the faculty and – due to her continuously documented project work - the student earns credit points for her master's degree.

## **4. Assessment *for* learning and the importance of feedback**

Since the goal of our study programme is to promote the students' personal competencies and their metacognitive capacity to self-organize their competency development, an assessment that fosters this kind of learning is a major issue. In the following we want to show why

feedback is an important variable to realize this kind of learning. As Baumgartner, Himpf and Zauchner (2009) point out there are three sources of feedback when assessing e-portfolios: Self-feedback, feedback from peers and feedback from an authority. In our case the reflection on the project work and the personal learning process as outlined above is a form of self-feedback. The evaluation of the project report by the faculty is a form of feedback from an authority and follows standardised assessment criteria. The feedback from peers is not yet fully implemented but viewed as powerful lever that needs to be augmented systematically in future versions of our assessment strategy.

#### **4.1 Criteria-based assessment of learning outcome**

Because it is neither possible to judge the reflections of the students with categories of “right” or “wrong” nor in direct comparison with other students, it is important to define assessment criteria that make sure that the grading is fair and transparent (Baartman, Bastiaens, Kirschner & van der Vleuten, 2007). Hence the assessment of the student’s learning outcomes by the faculty is based on the following criteria that apply to the project report:

- 1.) Overview of the project work: Does the project report give an insight into the work that was done in the project during the whole semester? Does the project report comprise the salient events that were documented in the project report into a coherent and comprehensible learning history?
- 2.) Quality of the reflection on experience: Does the project report reveal how one dealt with positive and negative experiences during the course of the project (successes, failures, uncertainty, etc.)? Are the consequences of these experiences reflected upon and are the learning outcomes explained?
- 3.) Reconstruction of competency development: Does the project report illustrate what was learned by participating in the project? Is it apparent that competencies were acquired during the course of action? Does the development of competencies become evident by referring to certain episodes in the learning history?
- 4.) Originality of the reconstruction of experience: Is the project report characterised by a personal voice of the student? Does the student bring forth thoughts that exceed the guiding questions contained in the template document? Does the student articulate any insights beyond the content of the project journal?
- 5.) Document structure and level of language: Does the project report have a comprehensible structure and inner coherence? Is the language without flaws and

other shortcomings? Does it convey clear and comprehensible messages? Is the author able to articulate her/himself in an adequate and definite manner?

- 6.) Relevance of the problem situation: Does the project report cover a problem that is relevant to the aims and themes of the bachelor / master courses? Does it describe this connection with the problem situation in a comprehensible style?
- 7.) Value of the results of the project work: Does the additional value of the results of the project work for third parties come across? What kind of value was generated for other people and how convincingly is this value communicated?
- 8.) Commitment and dedication to project group: Does the project report show what the author contributed towards the aims of the project group? Does the commitment of the author transcend individual goals and are his/her actions aligned with the goals of the project group?

These criteria were derived from an existing assessment schema the student's are already familiar with from other assignments in their formal studies and were adapted to the learning goals and assessment strategy of our study programme: The first five criteria address the learning goal of a sound reflection of the personal competency development, whereas the last three criteria take into account the context of the project work. Since they deal with the project results and the actual behaviour of the students within the projects, the latter can only be judged on the grounds of inferences from the project report.

Defining such assessment criteria is an important step but "giving students explicit assessment criteria alone is unlikely to result in them producing better work" (Rust, 2002, p. 151). Besides clear assessment criteria it is high quality feedback that makes the difference between an assessment *of* learning and an assessment *for* learning. It is feedback through "which we can influence the extent to which our assessment practices are developmental, rather than simply judgemental" (Brown, 2004, p. 84).

#### **4.2 Fostering reflective learning through peer-feedback**

Currently our students receive summative feedback on their project reports from the faculty. As this feedback is elaborate and includes advice for the improvement of the student's reflection on their competency development, it also serves a formative purpose (Irons, 2008). Since this kind of feedback is very time-consuming, the responsibility for giving feedback must be shared and peer-feedback should be part of the assessment strategy (Pitts, 2005).

When implementing peer-feedback in our study programme, it is necessary to differentiate between two levels of feedback: Feedback on the *project level* is related to project results and the actual behaviour of the student's within the project group, whereas feedback on the *individual level* is concerned with the competency development of the students. Based on this important distinction we want to outline our considerations concerning the implementation of peer-feedback in the study programme.

Possible sources of peer-feedback on the project level are the members and leaders of the communities of practice because they are directly involved in the project work. Also there is already an informal feedback on the project level when students talk about the results of their project work face to face or leave comments on the postings of the community blog of e<sup>3</sup>-portfolio. To foster this kind of feedback, we are currently implementing the option to transform postings in the community blog (which are visible for all group members) into the part of the project journal that describes the objective events (see table 1), so that only one member of the group would have to report on the results of the last project meeting. These postings can then be commented and discussed by the group. To make sure that individual impressions and opinions about these meetings do not get lost a "personal memo" (which is invisible for other persons) can be attached to the posting that was imported into the project journal. All kinds of feedback on the project level, however, are related to the project group's specific issues e.g. a discussion on the quality of an article for the student magazine.

On the individual level the option to share postings of the project journal (see table 1) – which are characterized by a deeper reflection on the learning process – opens up the chance to get feedback on one's own competency development. Theoretically this peer feedback could help the students to craft a more authentic learning story. In practice, however, feedback is time-consuming and students need to be given a reason to engage in giving feedback on the individual level. One solution might be to arrange learning tandems between the participants, another solution might be to make feedback a part of our assessment strategy. By assessing their fellow students' competencies students who give feedback benefit themselves as they develop their understanding of assessment criteria which is a precondition to becoming a "self-assessor" (Boud & Falchikov, 2006).

## 5. Summary, discussion and future work

In this paper we introduced the purpose of using e-portfolios in our study programme and outlined the structure of the software system we developed to fit this purpose. Next we sketched a brief scenario that illustrated how e<sup>3</sup>-portfolio is actually used in the study programme “Problem-solving competencies” at the University of Augsburg. Afterwards we showed how we combine the assessment *of* learning with the assessment *for* learning in this study programme. On the one hand we described how we guide the reflection of our students and explained our didactic rationale for this kind of scaffolding. On the other hand we pointed out how we assess the students’ learning outcomes and discussed how our blended assessment strategy could be enhanced through peer-feedback.

Students usually participate in our study programme out of intrinsic interest in the domain, community or practice of the project groups (Dürnberger & Sporer, in press). The reflection of their experiences - which is important for intentional learning - tends to fall short. As the design of an assessment has an impact on *what* is learned and *how* it is learned (Rust, 2002), we make use of extrinsic incentives like the certificate and credit points to motivate the students to reflect on their experiences within the projects. Through this reflective practice students learn about their personal competencies and move towards being a “reflective practitioner” (Schön, 1987). In this combination of practice, reflection and assessment the goals of the students, the goals of the project groups and our goals as designers of the study programme are aligned in a portfolio-based assessment strategy.

During the evaluation of the implementation we learned that the participants of the study programme would like to have taken into account the results of their project work into the assessment. Our process-oriented approach to assessment based on e-portfolios will therefore be complemented by a more product-oriented kind of assessment in the next re-design of the study programme. As the members of the faculty usually are neither members of the project groups nor always experts in the community’s domain of activity, it is hardly possible to directly assess the students’ competencies on the grounds of their work results and the behaviour in the groups. Therefore we plan to implement a final colloquium in which students present the best results of their project work and are questioned about their personal competency development as documented in the project report.

Furthermore, we plan to augment peer-feedback more prominently in our study programme. In this regard we need to take into account what the purpose of the peer-feedback should be. Does it focus on promoting the learning process (formative feedback) or the assessment of learning outcomes (summative feedback)? And should feedback be given on a voluntary basis (informal feedback) or are the students required to give feedback (formal feedback)? When using a summative feedback it is also necessary to decide if the peer-feedback should affect the final grade. An interesting model implementation can be found by Rubin (2006).

Studies show that students are reluctant to judge their fellow students and learners do not want to be graded by peers - especially when the feedback leads to a mark (Sippel, 2009). So when implementing peer-feedback we have to establish feedback rules in cooperation with the students. This makes sure that feedback is fair and of high quality (Värlander, 2008). Regardless which form of feedback will be implemented what is most important is to initiate a cultural change among teachers and learners. Students should not be ashamed when they make mistakes or face problems they cannot solve themselves. They should see them as a chance for learning and understand feedback as useful for their learning process rather than just judgement of their actual performance.

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