Turning to adaption through exploration in the education of Software Engineering

Magdalena Beslmeisl, Irmgard Schroll-Decker, Juergen Mottok
OTH Regensburg, Germany
{magdalena1.beslmeisl, irmgard.schroll-decker, juergen.mottok}@oth-regensburg.de

ABSTRACT

This paper aims to emphasize the importance of an activating teaching staff in the context of higher education. The presented application of Online learning journals in the domain of software engineering pursues this intention.

On the one hand, the method of a lecture accompanying Online learning diary is used for the individual and honest reflection of students and lecturers, on the other hand, it shall identify their status quo during the learning process. In order to use the resources of this instrument to its fullest extend, the role of the lecturer in the process of teaching and learning is elaborated in detail. The first section (contextual conditions) describes the application of Online learning journals in parallel with the lecture of Software Engineering at the OTH Regensburg. Especially the activating function of the instrument within students and lecturers during the semester is elaborated. The subsequent part of this paper discusses the difference of feedback and reflection (Feedback and Reflection - a short excursion) and how these two processes involve with the model presented, how they built on one another and how their implementation. In the third part (process structure / acquisition and evaluation procedures) the lecturer's key role in the process of reflection, after termination of the term, is explained. Group discussion as a method of qualitative research and its application in the case presented is essential. Results of the qualitative explorative research method are content of the fourth part of this paper (results of research). How those results might contribute to improve the processes of teaching and learning and what changes consequently arise, is finally addressed in the chapter "Outlook".

Keywords - Feedback/Reflection model; Online learning journal; Group discussion; Software Engineering

I CONTEXTUAL CONDITIONS

Implicit assumption of teaching in higher education is the teacher's function -especially in a theoretical and research-based scientific study path- to create his teaching in an activating manner and to activate students (cf. Bachmann 2013, p.11et seq.). Students are - unlike in times when they were referred to as "listeners"- expected to actively elaborate and acquire content. Both expectations require to reconsider the teaching-learning situation per se as well as in relation to the presentation of content and the process of teaching and learning.

The ability to reflect one's own learning processes and in conclusion to take responsibility for the own teaching and learning processes, cannot be "assumed a priori" (see Hilzensauer 2009, p.1) - neither for students nor for lecturers. This interaction is the reason to examine a one-semester teaching experiment with the following research question:
"How does teaching staff become active and provides support for students to become active with regard to their learning behaviour?"
As research method the "Online learning journal" was applied.

The experiment, aiming to approach the meta-goal of teachers taking over responsibility and activating students using an own internal impulse, is based on a systematic feedback and reflection model (s. Figure 3; it will be focused later on). By using the lecture accompanying Online learning journal within the lecture Software Engineering, lecturer[1] as well as learner is actively involved in a recursive learning process. Every week the lecturer´s devolop questions in order to rework the content on the online platform (www.oltb.de[2]) for the students. We subdivided three categories:

Table 1: Question categories in the Online learning Journal

Category I	Technical contents are focused - Aim: Repetition
Category II	Tasks/questions with focus on writing skills
Category III	Questions serving the self-reflection of learning behavior

The time limit to work on the questions is five days. This period is followed by three days of individual examination of the student's answers. In addition, one PhD and the student assistant analyze the answers. Collective or individual knowledge gaps can be identified within a team discussion, in which all team members are taking part, concerning category I-III. In the subsequent lecture, identified knowledge gaps or difficulties are discussed with the students.
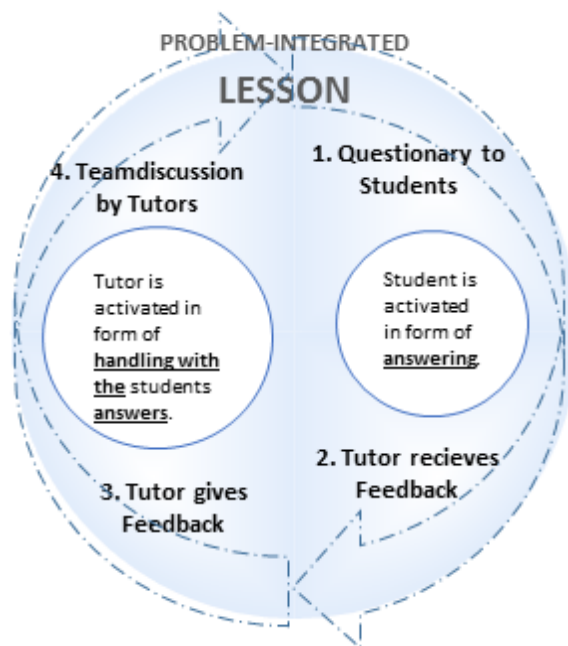

Figure 1: "Week-wheel"- Period of a Week out of the "Activation-View"

Figure 1 illustrates the weekly cycle (week-wheel) of activation: The Online learning journal gives students the opportunity of individual reworking of learning objectives immediately after the lecture and thus takes on an activating function for the students. Aim is the consolidation of knowledge and the reflection of own learning behavior (cf. Trautwein 2013, S. 118et seq.). The lecturer's feedback on the student's online responses provides- besides the selection of teaching content in advance of the lecture- a first activity of the teaching staff part. As lecturers analyze the student's online responses, the opportunity arises to identify for instance recognizable knowledge and understanding gaps out of the current course context and subsequently to process as well as to settle those in the following event (= problem-integrated lesson). The process of reciprocal feedback for state of knowledge and reflection (the differentiated use of feedback and reflection is explained within the following chapter) is repeated on a weekly basis during the semester. The lecture Software Engineering is literally "inter-active". Within this section

---

[1] In our case the lecturer/teaching staff consists of one Professor, three PhD´s and one master student.
[2] www.oltb.de is a german open source online platform. This medium supports teaching-learning processes with different features like for example to commentate and purpose continuing learning developments, the comparison of own learning processes and so on.

(Figure 1) the activating function of Online learning journal is described with regard to one lecture. Figure 3 in contrast, illustrates the role of a whole lecture unit in the overall construct of feedback and reflection of one semester. In order to address group discussion, the focused research tool of this paper and the terms of feedback and reflection are defined within the following chapter.

II FEEDBACK AND REFLECTION - A SHORT EXCURSION

In academic literature, the terms feedback and reflection are often used interchangeably and are not clearly defined. In order to answer the research question, a short explication of underlying terms is indispensable.

Feedback
To clarify the comprehension of feedback, the case of the application "week wheel" of Figure 1 is addressed. The explanation of feedback can be de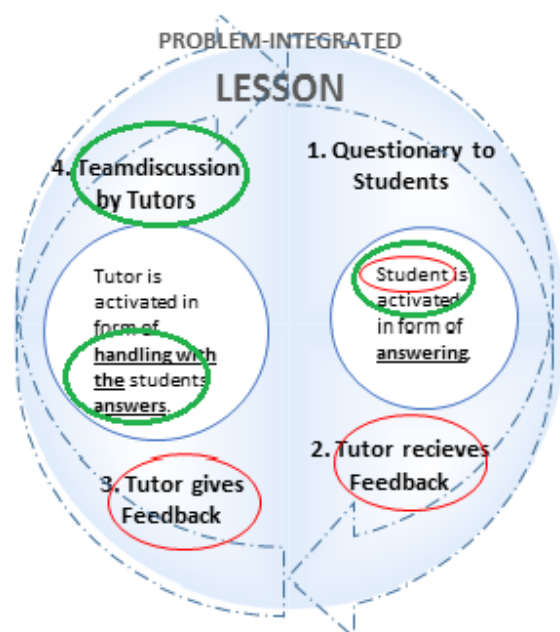rived from this description. In the present case, feedback takes place between two groups: students on the one hand and lecturers on the other. Apparent from Figure 2, two dimensions are addressed by Feedback:

Figure 2: Situations of the weekly Feedback (red-marked); Situations of a weekly Reflection (green-marked)

Dimension 1 "give feedback"; Dimension 2 "receive feedback". In the case of application of the "Online learning journal" the student's question answering (=activity) is followed by the lecturer's receiving of feedback (=received feedback) and causes a corresponding statement (=response/ giving Feedback) by the lecturers.[3] Feedback is considered in terms of response.

One person's reaction causes a statement, for instance a clarifying explanation (cf. Stangl 2012) or a behavior in another person. Here a distinction is made between "giving feedback" and "receiving feedback"

Reflection
In contrast to feedback, the concept of reflection is discussed from multiple perspectives. Derived from the Latin the verb "reflektere" it means reflect. Moon applies the term to the process of learning. According to her, professional reflecting is directed towards a learning process, but conversely, not every learning process is necessarily reflexive (cf. Moon 2004, p. 83). This statement describes reflection as a tool in the process of learning. One interpretation is that a further development should be aimed by using reflection in the context of learning. Wyss refers the process of reflection to conscious considering and thinking, which can appear before, during or after a situation or action (cf. Wyss 2009, p. 5). Muehlhausen extends the description to aspects of analysis and reflection, which results in

---

[3] The feedback lecturers receive is usually located in the question categories II + III, which also addresses learning place and learning environment

dividing the reflection process in two separate processes (cf. ibid. p. 6). Further differentiations of the reflection process could be given, but would not be relevant to the present examination and are therefore not included (see the essays of Hilzenauer and Wyss 2008). As definition of reflection should be noted, that reflection:

- Is purposeful;
- Is conscious reflecting and analyzing before, during or after a certain situation or action in processes of teaching and learning and/or education;
- Is taking place mentally or in written form;
- Can be distinguished between self- and external-reflection (see Wyss 2008, p.3);
- Can be related to further dimensions such as reflecting on learning subject, learning activity or ability to learn (see Hilzensauer 2008, p. 9);
- Can proceed process-like (on levels of description; analysis/interpretation, evaluation; planning) (see Bräuer 2014, p. 27);
- Can take place on different levels (meta-, meso-, micro-level) (see Wyss 2008 6f.).

Figure 2 shows to which extend processes of reflection are aimed during a week of lectures. [4] Specific questions aim to stimulate the reflection processes referring to learning subject (category I), learning activity and learning ability (category III) within the students. An example is: *"Which contents of today's lecture appear still unclear? Why do you need this content and how can you fill this knowledge gap?"*
These questions are associated to self-reflection, because students enter into a dialogue with themselves while thinking (cf. Kroath 2004, p. 84). Students are encouraged to identify their personal learning difficulties and content gaps while acting self-critically (cf. Siebert, quoted according to Hilzensauer, 2008, p. 7). Furthermore the lecturer's reflection processes are set in motion. As the lecturer is confronted with existing student feedback, self reflection is triggered. Questions posed by the lecturer are: "*Do the answers fit my pre-formulated learning goals? Are the answers technically correct? What contents have repeatedly been mentioned as not understood? What kind of personal/emotional context factors could have an impact on student's as well as lecturers answers?"*
In the discourse of teacher teams, the possibility of peer-reflection (see. Wyss 2008, p. 7), based on findings of previous self-reflection, arises. As a result, the following lecture can be adapted based on the results of peer-reflection.

Interaction of Feedback and Reflection
In summary it can be stated, that feedback can be given active and/or received more passively. The receiver initially doesn't need to induce any further actions. At least two people are involved in the process of feedback. Reflection in contrast fulfills a more extensive task: It is virtually an act that can take place even in a single person and - when used systematically- pursues focussed objectives. Feedback therefore can be seen as kind of "pre-function", which reveals potential for change and can lead to a systematic reflection. Thus it can be considered as valuable part of reflection. In the presented context, the commonality of both concepts can be described by their superior function as methods to raise awareness of personal actions/attitudes and to launch learning processes. When applied in combination, both thought and speech processes aim for the further development of teaching and learning processes. The model of systematic feedback and reflection presented in part III takes up the idea of upstream and integrated feedback. It controls the reflection process within and even more after the lecture (see. Bastian / Combe / Langer 2007, p. 11).

---

[4] The reflection process will be elaborated more detailed in the third part of this paper, because focus of this part is the activation of lecturer staff, which takes place after the lecture period.

III   PROCESS STRUCTURE / SURVEY PROCEDURE AND EVALUATION

The quality of purposeful reflection is significantly depending on structure and methods of the reflection process (see Bräuer 2006, p. 346). Therefore the process structure of the applied systematic feedback and reflection model is revealed at the beginning of section III (Figure 3).
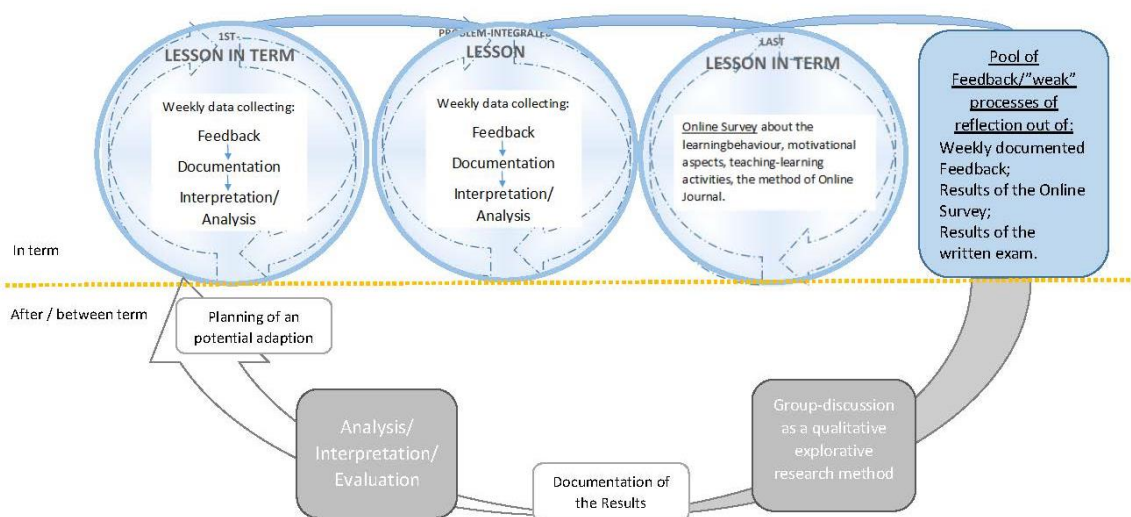

Figure 3: Systematic Feedback-Reflection model

Process structure

The area above the yellow line summarizes the feedback and reflection processes during a semester lecture cycle. After each lecture the students are asked questions, their answers are documented, interpreted and analyzed. Identified knowledge gaps and emotional statements are discussed in the next lecture unit. This process is repeated throughout the semester. In the last lecture unit, students complete an online survey concerning learning behavior, motivational aspects, teaching-learning activities and the instrument "Online learning journal". Thus a pool of feedback and "weak" reflection processes is generated out of different sources. According to Bräuer (2014, p. 29) reflexive evaluation is situated on various levels. The reflection during the semester is located on level 2 out of four possible levels. The process of activities (in this case the answers and abnormalities gathered with the Online learning journal) is *documented (level 1)* and *circumstances of those activities are analyzed and interpreted (level 2)*. The lecturers receive comprehensive explanations about circumstances during student learning activities (see Table 1 in. Bräuer, 2014, p. 29). As the student answers concerning learning contents shall be given well-founded, specific causes can be derived. Measured on Bräuer's levels of reflection (cf. Bräuer, 2014, p. 29) those two reflection processes can be assigned to the basic levels.

In order to achieve the prime goal of the reflection process described, namely the activation of student learning behavior due to their lecturer's activities, another source of knowledge is necessary.

Survey and reflection measures concerning level 3 and 4 of the reflection process

The still "weak" reflection processes of teachers (=activity of lecturer staff) can trigger development processes within students, for instance when activating their own learning

behavior. An example is the acquisition of knowledge in addition to the lecture with the help of the Online learning Journal. However, these adjustments are mainly confined to technical and content areas. Likewise the reflection taken place so far only takes place in a regular cycle of one semester. So far, the student's feedback concerning content structure or selectively addressed self-reflective questions, does not give any further insight into the student's experiences with the Online learning journal and its impact on learning behavior. The Student's emotions, attitudes and opinions concerning conditions (amount of time, communication between teachers and learners, methodology, etc.) are not taken into account sufficiently in the previous process of reflection. So far, the teachers view on students dominates their behavior during the semester. This "image of students" shall be expanded due to the dialog via online survey. The gathered information is indispensable for an "adaptive learning process" as it is assumed, that students experience the teaching-learning process different than lecturers (see. Bastian/Combe/Langer 2007, p. 13). Insights concerning emotions, attitudes and opinions regarding the learning context, communication between teachers and learners, the methods and the provision of performance evidence (written exam at the end of the semester), have not been considered enough during the semester. The third of the levels defined by Bräuer (Level 3: A completed activity is be evaluated) (cf. 2014, p. 29) is obtained when results of the online survey are evaluated. Conspicuous multiple responses to open questions of the survey, which arose as disincentive to self-learning behavior were noted. The results are presented in part IV.

Also lecturers are involved in the process of feedback and reflection and evaluated concerning their teaching-learning activities after the lecture period. According to Bräuer, they should undergo the third phase of the reflection process like students do.

The survey measure for teachers is a qualitative-explorative method, the group discussion. It is a form of self-reflection, which is closely linked to the research subject. Methodology and research subject therefore influence each other reciprocally (Loos/Schäffer 2001).

The decision for this survey method results from the consideration, that information which could not be gathered by a quantitative measure, is exchanged during a conversation. A group dialog can generate new insights. Core of the dialogue are actions and interactions with persons (in this case with students/colleagues) that take place within the framework of the Online learning journal and the lecture Software Engineering. Through impulses of a moderator, the research subject is kept in focus. The basic incentives of group discussion pursue evaluative moments, such as the emotions, attitudes and opinions of the lecturers concerning basic conditions and students during the semester. Examples of question impulses are: *"How does the Online learning journal impact your point of view on the students? Did it change? How important was the structure of question categories?"* Towards the end of the discussion, the compound of Online learning journal with the supply module Software Engineering was brought to bear:"*...so does the Online learning journal fit to Software Engineering?"* Only a couple of question impulses from an one-hour discussion, which became kind of independent and exceeded the scheduled duration, were mentioned. The systematical and structured evaluation of the group discussion is based on the qualitative content analysis of Mayring (2010). The group discussion transcript is structured, in order to filter different aspects of the data material. The categories/criteria described in table 1 serve as base (see. Mayring 2010, p. 65). Structure dimensions, which can be subdivided in teaching and learning promoting (D1) or inhibiting (D2) factors that may influence the teaching and learning activity, can be derived from the research question. The following categories are explicitly defined, to which the textual elements of the group discussion are associated with:

Table 2: System of Categories following the qualitative content analysis

Category	Definition
1) Student's registered feedback for teaching staff	Feedback from students for teaching staff: the parties involved inform themselves about their different point of views and their mental state. The written and oral dialogue between students and teachers promotes the teaching and learning activity.
2) Reflection within the team (Online learning J. – Students)	Exchange among lecturers: That means students action within the Online learning journal are reflected based on feedback from the students in terms of reflection with the possibility of further development
3) Attitude of lecturers	Attitude with respect to students: The awareness of the term "student" is expressed. It becomes evident how lecturers perceive students.
4) Expectations	Expectations towards students in the context of higher education: It is expressed what expectations lecturers have towards students. The expectations relate to the higher education.
5) Potential Online learning journal (as method)	The Online learning journal as a medium to support teaching and learning: the Online learning journal supports a teaching and learning environment, which intends to activate students/lecturers.

Structuring the content into different categories offers the possibility to extract focused topics, contents and aspects out of the gathered material. The results are discussed in section IV. As the evaluation of results shows, different categories are mutually dependent. The text passages allocated to the categories refer to each other and are considered to be independent; in the overall context they cannot be considered selective.

IV   RESEARCH RESULTS

Subsequently the results of the online survey and the group discussion are contrasted within the dimensions D1 and D2. This seems reasonable, because the research question is addressing teaching and learning promoting (activating) as well as teaching and learning inhibiting (deactivating) aspects of Online learning journals in the lecture of software engineering. The results of the online survey are explained form the learner's perspective, while the results of the group discussion represent the lecturer's point of view.

Table 3: Summary of the research Results

Dimension	Perspective
	Teacher's perspective
D1) Teaching/ Learning promoting/ activating aspects	- Motivation is given due to participation of students at the Online learning journal - Personal contact with students is promoted - Further development of the method Online learning journal during use reduced distance to students - Different knowledge levels of students became clear → an individual reaction to the students different states of knowledge becomes possible - Gain of respect - Students are not assessed

	- Transparency **Teachers provide security and confidence**	
	Student's perspective	Teacher's perspective
D1) Teaching/ Learning promoting/ activating aspects	- Assessment of individual knowledge gaps - Receiving individual feedback - Continuity and regularity of processing - Distribution of learning volume Exam preparation - Intercepting effect on not adequately mediated teaching contents - Course accompanying worksheets - Trust and confidence promoting platform - Requirements are more comprehensible **Students search for/need security and trust**	- Diversity among students can be addressed - Individual feedback is possible - Flexible structure of the Online Journal is important **Individual support/diversity/ flexibility**
	Teacher's perspective	
D2) Teaching/ Learning inhibiting/ deactivating aspects	- Unmotivated, faltering answers - Full potential of the methodology cannot be used due to lack of time - Learners are considered to be dependent **time aspect / expectations and attitudes towards learners limit the capacity to act.**	
	Student's perspective	
D2) Teaching/ Learning inhibiting/ deactivating aspects	- High expenditure of time - Poor feedback to the lecture - Partly unfriendly communication via Online learning journal - Comparison with student's worksheets (too much aid?) **pressure and lack of / poor communication among the teaching staff**	

Dimension 1) Teaching and learning promoting, thus activating aspects

Security, trust and learning promoting conditions are considered to be important key aspects when dealing with learners. The results of the group discussion confirm, that based on personal contact, which arises due to the Online learning journal (for instance by email after the lectures), confidence is built and a motivating working relationship is formed. The learning and the teaching activity is stimulated. The feedback received promotes security within learners and teachers. This security is reflected in their actions. Trust includes respectful behavior towards teachers and learners, thus a transparent feedback becomes possible.

Individual student support, the option to consider **different knowledge and need levels** of the students as well as the **flexibility** and adaptability within the questions asked, are further learning promoting aspects. Through the Online learning journal teachers old patterns and ways of thinking of the teacher can be disrupted. The Teacher becomes aware of their traditional and own logics concerning teaching content. A better understanding of the learner's logic, confronted with the teaching content for the first time, is provided through the feedback in the Online learning journal. The flexibility of being able to respond individually to develop adapted questions and respond indivitiually to given answers, is a learning promoting aspect with high added value.

Dimension 2) Teaching and learning inhibiting, thus deactivating aspects

The **exertion of pressure** and **lacking or poor communication** (within lecturers staff or between lecturer and learner) are central facts in teaching and learning inhibiting categories. The teaching staff shares certain **expectations and attitudes** towards the students. The learners mention in the online survey feeling a certain pressure. When the Online learning journal was initially implemented at the OTH Regensburg in software engineering, the lecturer had certain pre-expectations towards the students. Students were often assumed in

the role of pupils. Words like "lazy" or "lack of motivation" were mentioned. These attitudes, formulated admittedly exaggerated, probably have an -unconscious- influence on the lecturers teaching behavior.

Furthermore the factor **time** is a learning and teaching inhibiting factor. The processing time of the Online learning journal, which was supposed to be half an hour at the beginning of the semester, was exceeded regularly. The extra amount of time students had to invest inhibited their motivation. In retrospective the extra amount of time was demotivating for teachers as well. Questions were answered minimally. The lecturer staff reduced commitment to provide value-adding questions. The mentioned inhibiting factors affected the teacher's capacity to act and had a demotivating impact.

V   OUTLOOK

The consequence of this intermeshed evaluation is to plan new strategies for action. The fourth level *(Level 4: As a consequence of a completed activity new activities and strategies are planned)* of a reflective practice by Bräuer (see Bräuer 2014 p.29) is elaborated in the last part. The plan accompanying question may be summed up as follows: "How can the student's self-learn activity be promoted realistically within the next semester, based on the obtained categories (see Table 2)?"

It has to be anticipated, that the Online learning journal is a multi-faceted course accompanying method, which has been evaluated very positively by students as well as teachers. The subsequent planning contents for the Online learning journal are therefore prioritized highly. Based on the evaluation two main objectives Obj1 and Obj2 are aspired:

Obj1) Teaching and learning promoting aspects perceived by teachers and learners, shall be maintained and further developed.

Evaluation results are:

a) Teachers provide security and confidence
b) Learners search for/need security and trust
c) Individual support/diversity/flexibility

Obj2) Identified teaching and learning inhibiting aspects shall be redesigned and/or adapted.

Evaluation results are:

d) Time aspect
e) Expectations and attitudes towards learners limit the capacity to act
f) Pressure
g) Lack of/poor communication among teaching staff

In the following paragraphs proposals for selected results (1-7) are formulated, as a complete planning structure would exceed the framework prescribed.

a) The contents of the Online learning journal should continue to be without an evaluation by grade. This creates a confidence-building working relationship. Furthermore it is important to give punctual feedback to the student's answers within the Online learning journal. Feedback on not understood contents provides security for the learner during the learning process.

b) The proposals formulated here are closely linked to those under a). The two groups are referred to each other in the teaching-learning process. The feedback obtained individually provides safety for students. It is therefore important to admit personal contact even exceeding the Online learning journal, *for instance via e-mail or personal contact in the teacher's offices*. The Online learning Journal as a structuring method of the learning process

seems to be very important to students. The weekly employment and continuity of the procedure gives security and satisfaction within the learning process. The structure within the questions (Category 1-3) causes routine during processing and is perceived as pleasant. Thus it is worth to maintain the *structure of the questions as well as the structure of the process.*

c) Concerns that are not of technical/content nature can be addressed. Individual concerns are not always concerns of the whole semester group, but still should be taken seriously. This includes, for example, that a learner is not able to understand a particular subject despite explanation or consultations. A further accompaniment of this person is possible due to Online learning journal. Here an elaboration of *future learning strategies, which offer individual support*, together with the student is desirable.

d) During the semester it became apparent that the time specification for processing the weekly questions was too low. Thus learners became unmotivated. During the group discussion it also became evident, that due to this restriction displeasure was spread among teaching staff. Questions could not be asked to the desired extent, because the boarder pronounced at the beginning, would be broken. The optimization proposal is *to not specify any time information*, as every student needs different amount of time for processing. The *scope of questions should be varied according to the need.*

e) The expectations and attitudes lecturers unconsciously induce in teaching learning events are a separate issue. During the group discussion, students were constantly compared with pupils. The image of the self-responsible student, which is spread in study programs is on the other hand hindered by the teacher attitude. They are confronted with acts of teaching that are similar to the questions from the classical school hierarchy. Future questions of the Online learning journal will be asked in a way, that they aim for *self-closing of an issue*. This is to enable the learner's independence and emphasize adequate handling.

f) During the studies performance pressure is perceived within students. The Online learning journal in software engineering aims to reduce this pressure at the end of the semester. Individual, *out of the closing date received answers* are *included in the feedback loop.*

g) Lack of/unpleasant communication within teaching staff leads to an inhibitory learning atmosphere among learners. These have a strong sense of how the feedback within the lecturer's team is working. *5-10 minute presentations* at the beginning of the lectures of next semester will inform future students about most important points from the weekly Online learning journal periods. Thus a regular *common current state* of knowledge levels is made possible.

VI CONCLUSION

"Conversation leads to real understanding. Starting and excited by something puzzling, looking for the reason." (Wagenschein, Martin).

The feedback and reflection model presented includes all stages of a reflection process (levels 1-4). It starts with feedback units that are continuously linked to the teaching-learning context. The groups involved in the teaching-learning process are included. Communication between persons and groups of students and teachers implies a permanent activity during the semester. Circumstances of activities during courses can be analyzed and interpreted. The Online learning Journal offers the possibility to reproduce own knowledge as well as to address sensitivities detached from the lecture. This free space contributes to a situation-adapted feedback. In the penultimate phase of reflection practice the events during the semester are addressed. Also this phase is undergone by both groups of persons.

The research methods selected for this application could be adequately replaced for example, if the group discussion, the online survey or the evaluation method (qualitative content

analysis) is not practicable. It is important to conduct the scientific survey of teaching-learning events when participants are present. The online survey was chosen because of its low-threshold use. It also represented the last task at the Online learning Journal. Participation of all students was assured. All teachers were able to attend the group discussion except one.

The evaluation of the data, the open-minded attitude during the evaluation, turned out to be one of the most challenging tasks during the reflection process. The results form the basis for further development of an activating-university teaching. The added value of the feedback and reflection process compensates the high time expenditure as well as personnel use during and after the semester.

REFERENCES

Bachmann, Heinz (2013): *Aktivierende Hochschullehre – kompetenzorientierte Hochschullehre variantenreich gestalten.* In. Heinz Bachmann (Hg.): Hochschullehre variantenreich gestalten. Kompetenzorientierte Hochschullehre – Ansätze, Methoden und Beispiele, Bern, S. 11-18

Bastian, Johannes; Combe, Arno; Langer, Roman (2007): *Feedback-Methoden. Erprobte Konzepte, evaluierte Erfahrungen.* 1. Aufl. s.l.: Beltz.

Bräuer, Gerd (2014): *Das Portfolio als Reflexionsmedium für Lehrende und Studierende.* Opladen: Budrich (Kompetent lehren, 6).

Hilzensauer, Wolf (2008): *Theoretische Zugänge und Methoden zur Reflexion des Lernens. Ein Diskussionsbeitrag.* In: bildungsforschung, Jahrgang 5, Ausgabe 2, URL: http://www.bildungsforschung.org/Archiv/2008-02/lernvermoegen/

Loos, Peter / Schäffer, Burkhard (2001): *Das Gruppendiskussionsverfahren. Theoretische Grundlagen und empirische Anwendung.* Opladen : Leske und Budrich

Mayring, Philipp (2008): *Einführung in die qualititative Sozialforschung. Eine Anleitung zu qualitativem Denken.* 5. Aufl. Weinheim, Basel: Beltz (Beltz Studium).

Mayring, Philipp (2010): *Qualitative Inhaltsanalyse. Grundlagen und Techniken.* 11., aktualisierte und überarb. Aufl. Weinheim: Beltz (Studium Paedagogik).

Moon, Jennifer A. (2004): *A handbook of reflective and experiential learning. Theory and practice.* London, New York: RoutledgeFalmer.

Kroath, Franz (2004). *Zur Entwicklung von Reflexionskompetenz in der LehrerInnenausbildung. Bausteine für die Praxisarbeit.* In S. Rahm & M. Schratz (Hrsg.), LehrerInnenforschung. Theorie braucht Praxis. Braucht Praxis Theorie? Innsbruck: Studienverlag, 179-193.

Stangl, W. (2012). *Feedback.* Lexikon für Psychologie und Pädagogik. Unter: http://lexikon.stangl.eu/autor/ (Zugriffsdatum: 18.08.2015)

Trautwein, Christian (2013): *Struktur und Entwicklung akademischer Lehrkompetenz. Die Bedeutsamkeit individueller Lehr-Lern-Überzeugungen.* In: Heiner, M. / Wildt, J. (Hg.): Professionalisierung der Lehre. Perspektiven formeller und informeller Entwicklung von Lehrkompetenz im Kontext der Hochschulbildung. Bielefeld: WBV, S. 83- 129

Wyss, Corinne (2008): *Zur Reflexionsfähigkeit und -praxis der Lehrperson.* In: Bildungsforschung, Jahrgang 5, Ausgabe 2, URL: http://www.bildungsforschung.org/Archiv/2008-02/lehrperson/

BIOGRAPHICAL INFORMATION

Magdalena Beslmeisl is a scientific officer at the OTH Regensburg in Germany. She works in an interdisciplinary project which aims to optimize the education of software engineering in higher education. Her task as a pedagogue is to develop experimental didactical strategies especially in software engineering. She researches in a self-reflective way to optimize teaching conditions to activate learners in an adaptive way.