

Hearing the Student's Voice - Patterns for Handling Students' Feedback

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Abstract: Feedback is an important value in agile methodologies. It is also essential for any context where people are learning. Typically the focus is on *giving* learners feedback on their learning progress, either from an educator's point of view or between the learners via peer feedback. This paper focuses on *gaining* feedback from learners. We discuss methods and good practices for encouraging learners to switch their perspective from a recipient of facts to a critical observer of material produced by peer students and educators. This is essential both for educators (as a way to learn more about their own teaching) and for students (to be able to express opinions and give constructive feedback).

1. Introduction

The following patterns describe good practices for gaining and handling feedback *given by students*. The patterns focus on educators and facilitators at higher level education institutions who aim at raising the level of critical thinking of their students.

Critical thinking is relevant especially in areas that do not offer simple “right” or “wrong” answers, but where solutions to problems have to be chosen from solution spaces with several dimensions of freedom. The resulting solutions thus have to be produced through intensive interaction between several stakeholders; these should be able to (a) identify their interests and (b) express them in a way others can build upon.

The intensive interaction between the various stakeholders such as teachers, experts, and students heavily relies on constructive feedback. Since the students have the freedom to construct their solution from a large design space, they require feedback in order to understand how their solution is perceived by others. As long as this feedback is expressed as constructive feedback, the student will be forced to reflect on her individual solution and potentially revise the design decisions based on the advice given by others.

The ability to give constructive feedback and the strategies to digest feedback given by others are thus important soft skills that become especially important in teamwork that is omnipresent in modern work places. Since more and more

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work places involve distributed interaction (and since distributed interaction becomes more important in educational settings as well), we will also discuss how feedback can be gained and given in distributed computer-mediated settings. While the mechanics for distributed computer-mediated interaction have been described before [Schümmer & Lukosch, 2007], we focus on the way how standard collaboration support such as Wikis, forums, or e-mail can be used to support feedback.

The general questions that have to be answered by the following patterns are:

- **Who** is giving feedback? Typically it will be students, but other interest groups are possible.
- **On what** is feedback given? On lectures, presentations, design proposals, written text by teachers and students.
- **How** is the feedback expressed? A feedback culture needs to be established, an etiquette especially for constructive feedback.
- **To whom** is the feedback given? How large is the audience? In which setting is the feedback given (e.g., face-to-face discussions vs. anonymous interaction in a web-based forum)? How comfortable students feel to speak up?
- **What for** is the feedback given? It should be taken seriously and digested thoroughly. In the ideal case, it should improve the competencies of the feedback taker.

We can also distinguish between informal and formalized feedback. Informal feedback is highly individualized and takes place during the course: students in the same course share their views on the learning experience or teachers give the students feedback on their progress. Formal feedback is typically part of a university's QA program. In German universities, these programs model a formal process that was accredited when the master or bachelor program of the university was established. Since the formal processes are typically not under control of one individual teacher, we do not consider them in our pattern collection.

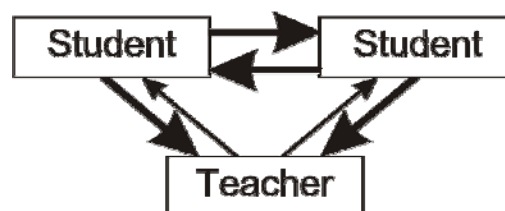


Figure 1: Directions of feedback (fat arrows are focused in this paper)

Considering the interaction in a course, we distinguish three different feedback channels: From teachers to students, from students to teachers, and between peer students. The feedback from teacher to student has been covered in other pattern languages before. We suggest looking at the feedback patterns provided by Eckstein et al. (2002) if your desired direction for feedback is from teachers to students.

The evaluation patterns of Derntl (2004) describe how the students' progress can be measured and how students can get feedback on their performance.

In this paper, we focus on the other two paths for feedback in which the student is giving the feedback. Especially the feedback among students does to our experience contribute to the critical thinking which we would like to increase for the students.

A general question for feedback patterns is whether feedback can be given anonymously or not. Anonymous feedback is especially important when critical feedback could influence the grades of a student. In such cases, students could fear that a critique of the teaching would result in bad marks for them. Anonymous feedback – on the other hand – often tends to be too harsh, especially when the feedback giver is not used to receive or give feedback.

In this paper we are not interested in grading, neither teachers nor students. We think that the application of agile values should result in a more balanced relation between teacher and students.

2. The Pattern Collection

This paper contains the following patterns:

YOU ARE HEARD: Ensure that students see that their feedback is considered as important and that the feedback can have an effect.

FEETIQUETTE: Give students guidelines on how they should express their feedback.

FEEDBACK SCAFFOLD: Help students to structure their feedback by giving them an outline of the feedback they typically give.

PEER-RATED COMPETITION: Let students rate other students' work and give a special reward to those students who have received the highest ratings from their peers.

STUDENTS' FEEDBACK FIRST: Give students room to express their feedback before you as a teacher give feedback from your perspective.

PEER CORRECTION: Let peer students correct assignments and make clear that the ability to rate a solution is another important way of understanding the assignment's subject.

EXHIBITION: Let students present their work to the whole class or even to future and past students and honor outstanding exhibits.

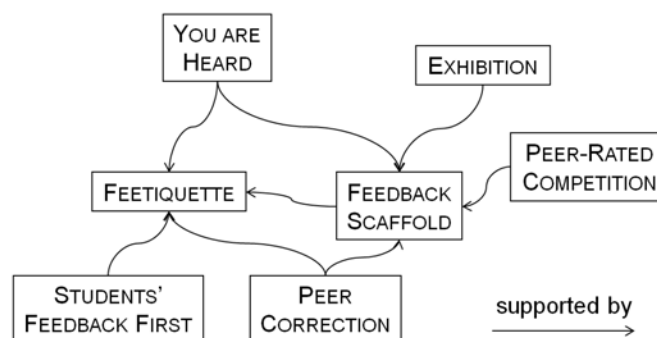


Figure 2: The patterns of this paper and their dependencies

2.1 YOU ARE HEARD

Context: You are teaching a course with a large audience (more than 100 participants), either in classroom or in distance education. Because feedback from the audience during lecture time is difficult due to time constraints (or for technical reasons in distance education, or because students are too shy to speak up in large audiences in the lecture room), you have decided to give the students of your course a *feedback channel* by means of an electronic forum, a newsgroup, or at least a contact e-mail.

Problem: It is hard to find the balance between 'no feedback' over this channel and 'too much feedback'. Sometimes students don't use the channel at all. Sometimes they are eager to express all their opinions and report on their experiences during the course, so that the teacher can not find the time to comment on all messages, especially in large courses.

Forces:

- Students are reluctant to provide written negative feedback as it persists (sometimes longer than the urge to write it down).
- Students assume that the teacher will be equally interested in giving them personal feedback as they are in giving it.
- RECIPROCITY (Schümmer & Lukosch, 2007) argues that any computer-mediated interaction should create a balance between efforts and benefits for all stakeholders. However, the distribution of efforts is not reciprocal in large courses since the students only have to contribute their personal view and the teacher would have to answer all these messages.
- Feedback should have an effect. In the case of feedback given by students, they expect that the course improves through their feedback.
- You want to increase the students' skills and competencies like sociability, reflection on various viewpoints and communication skills.
- Students can comment on their peer's feedback but since they don't have the final authority (e.g., for giving the grades), their feedback is often not considered as binding.

Solution: In at least one lecture, explicitly encourage the students to use the feedback channel. Define the kind of feedback that will be helpful. Make clear how fast you will reply to the student's feedback and how extensive the replies can be. Show the students how their feedback changed the course and how it helped them and others to learn.

You may decide to create a compiled response referring to multiple feedbacks of the students, especially when different students provide feedback on related topics. In such a case, you should ensure that the references to the feedback become visible so that the students can see that their feedback was heard.

Technology Support: Most online platforms (such as Moodle, CommSy) or even a simple net news server provide a component for THREADED DISCUSSIONS (Schümmer & Lukosch, 2007). These can be used to collect feedback and reply to it. Some systems also allow to FLAG (Schümmer & Lukosch, 2007) or tag a message. In such a case, you can flag messages that you considered as

correct, which would be the most lightweight form of telling the students that their messages were heard.

As long as you personally welcome positive and negative feedback, you should share the feedback with the whole class instead of having it sent to you by personal e-mail. This allows other students to see their peer students' feedback.

Discussion: If feedback is seen as an important part of learning in higher education, then it should be addressed explicitly. The fact that you appreciate feedback and encourage students to improve the course can be another incentive for the students to take a closer look at the course's subject. By saying that you need the students' feedback, you also emphasize on the fact that you can also make mistakes. This may invite students to critically evaluate the content you teach them.

Examples: In our introductory programming course at the University of Hamburg, we have been using the online platform CommSy for several years, mainly to distribute the digital material for the exercises and lectures. Because the platform offers a discussion forum as well, a feedback channel is provided implicitly. But this channel was not used by the students. Only after we explicitly encouraged the students during one lecture to make use of this channel, students started to comment on the problematic aspects of the course.

Related Patterns:

- **STUDENT'S FEEDBACK FIRST:** You may decide to delay your responses to the feedback given by the students and encourage other students to reply first. However, you should still ensure that the students understand that YOU hear their feedback.
- **PEER CORRECTION** can be used if there are still too many students so that you cannot reply to them individually. In that case, other students act as your delegates. But you should still stay aware of the feedback given by the students.
- **TIME FOR REFLECTION** (Manns & Rising, 2005) takes a broader perspective on the importance of feedback. The authors argue that any long-term activity should be interrupted by phases of reflection. The student feedback can serve as a trigger for such reflection episodes. Once students express feedback, they trigger teachers (and other students) to reflect on their current practice as well.

2.2 FEETIQUETTE

Context: Any teaching context in higher education, independent of the group size, course format or distribution of the participants.

Problem: Feedback can be harmful if done wrong.

Forces:

- If students are very unhappy with a teaching situation they can tend to act very emotional.
- Unfair feedback can lower or even destroy motivation, both on the side of the teacher and of the student.

- Students can be forced to attend the course because it is mandatory in their particular program.
- Especially with weak contributions students can be nasty.
- Different People deal differently with personal critique. Some simply ignore any kind of feedback; others misunderstand even positive and constructive feedback as de-motivating.
- In distance education, feedback is typically expressed as text. If given without intensive reflected, it quickly becomes harmful and the lack of non-verbal clues makes it difficult for the receiver to understand how the feedback was intended.
- Potential anonymity or pseudonymity of computer-mediated feedback can lead to situations where the feedback giver becomes offensive since the feedback giver does not expect any negative consequences (note that this is a general problem in computer-mediated communication).
- Textual computer-mediated feedback can be persistent, which makes harmful statements in the feedback even more harmful (the feedback can still be read a long time after it was given and may thus still hurt).

Solution: Explicitly introduce an etiquette for feedback (a 'feetiquette').

Give an appropriate explanation of how you understand the term feedback in your context, as part of a presentation and/or in written form. Point out the importance of feedback, but at the same time make clear that feedback is often subjective, i.e. highly influenced by the individual situation of the feedback giver. Explain when feedback can be given and what forms of feedback you consider as helpful in your course. Clearly state that feedback should always be constructive to be helpful.

Technology Support: If a technical feedback channel is identifiable as such, the infrastructure could ask for a confirmation, asking if the feedback typed in should really be sent and pointing out the possible consequences. The feedback etiquette could be shown in this dialog as well. This gives the student the explicit chance to reconsider the consequences of the feedback.

Discussion: By having a feetiquette, the students agree on a feedback culture that shares the values expressed in the feetiquette. Trying to adhere to the feetiquette makes them reflect on the way how they provide and receive feedback so that they finally improve the way how they provide feedback. Moderators (i.e., teachers) can give meta-feedback on feedback using the feetiquette as a FEEDBACK SCAFFOLD for the meta-feedback.

Examples: At the University of Hamburg, we apply this pattern in a regular course on design patterns, where students present use cases of design patterns to each other in a special form called 'teachlet' (Schmolitzky, 2005). We give a short presentation on the term feedback and hand out a one page description of our feedback etiquette for the course.

An example, which is not in the educational domain, is the feedback etiquette for e-Bay (online at http://reviews.ebay.com/FEEDBACK-ETIQUETTE-netiquette-POSITIVE-neutral-NEGATIVE_W0QQugidZ10000000000079805). It explains dos and don'ts for giving feedback on a transaction.

Related Patterns:

- NETIQUETTE (Schümmer & Lukosch, 2007) focuses on rules and guidelines for interaction in computer-mediated contexts. Good Netiquettes can become part of the FEETIQUETTE in distance education contexts.
- FAQ (Schümmer & Lukosch, 2007) describes how information about a community's culture and norms can be given based on questions asked by members. The FEETIQUETTE can fulfil the role of a FAQ for procedures on giving feedback.
- FEEDBACK SANDWICH (Eckstein et al., 2002) argues to start and end with positive feedback. It is one typical rule that can be part of a FEETIQUETTE.

2.3 FEEDBACK SCAFFOLD

Context: A teaching situation with a lot of interaction between students (presentations, discussions). Feedback can be given on several levels of abstraction, from presentation style to presented content.

Problem: Students do not know how they should structure their feedback. They fail to distinguish important aspects that require feedback from aspects that do not need further comments.

Forces:

- If feedback can be given on several levels of abstraction it can be difficult to be systematical.
- Students often feel that there was something wrong with a presentation, but cannot put a finger on it.
- Feedback is sometimes given in a destructive manner.

Solution: Provide an Outline of a good feedback. Pass this outline together with an explanation how to flesh out the different parts of the scaffold with feedback.

Technology Support: Technology support can help by providing online forms for feedback. It should give the teachers means for adding their questions to a template (e.g., as Wiki templates proposed by Haake et al. (2005)) from which the students then create their feedback documents. The technology should however be open enough to allow free-form feedback (at least one free text field).

Discussion: The scaffold gives the students a structure by which they can develop their feedback, but an outline can also block creativity. If students feel that they need to follow a certain scheme they can be tempted to not think outside of it. You should thus explain the students that they are free to extend the structure proposed in the scaffold.

Examples: At the University of Hamburg, we apply this pattern in a regular course on design patterns, where students present use cases of design patterns to each other in a special form called 'teachlet' (Schmolitzky, 2005). Because teachlets consist of several parts that are clearly distinguishable feedback can be very focused on these parts. It is then helpful to have some

standard questions at hand that have proven to be helpful in finding good feedback comments. We provide such questions in a one page document (different from the feedback etiquette).

At the University of Hagen, we provide FEEDBACK SCAFFOLDS for PEER GRADING (Eckstein et al., 2002). The scaffold guides the students through the review process and shifts their attention to different aspects of the feedback process.

Most review processes for scientific publications provide a review template. Reviewers use this template to provide constructive feedback on different aspects of the reviewed paper.

All evaluation questionnaires are examples for the FEEDBACK SCAFFOLD. The FEEDBACK SCAFFOLD pattern, if applied correctly in this area, would help the designers of the questionnaires to provide space for free feedback (e.g., an open-ended text field).

Related Patterns:

- SOFT SCAFFOLDING (Pachler et al., 2009) highlights the importance of providing scaffolding structures for e-learning settings.

2.4 PEER RATED COMPETITION

Context: During your course, you have students working in small groups on a larger design problem. All groups work on the same problem.

Problem: Students tend to focus on their own solution and to ignore other, potentially better ways of solving the problem.

Forces:

- Students have different levels of proficiency upfront.
- Some courses are not graded. If reaching any solution is the main criteria for passing the course, students focus on reaching one solution, ignoring the solution's quality.
- Some students love competitions, especially ambitious students.
- Students should be aware of the possibility of different quality criteria.

Solution: Let the students select the best solution through several rounds of selection and offer a reward for the best solution. Let them first present their solutions to two or three other groups and make them elect the best solution out of these. Let them decide based on quality criteria that are explicitly set up by the students. Make all the winners present again in front of the whole course. Let the solutions be rated at the end of the course and offer REWARDS (Schümmer & Lukosch, 2007) for the best solution. You can define more than one category where teams can win.

Technology Support: You may decide to have one or more rewards where the class is the jury (extending the idea of a (RATED) EXHIBITION). In such cases, you can support the students in the election of the winners by using a VOTING (Schümmer & Lukosch, 2007) system.

Examples:

In 2004, we taught a beginners course on Java programming at the FernUni Hagen. Since the students had very diverse previous knowledge, we decided to require rather basic programming skills to pass the course while at the same time creating a competition that should encourage good students to create their best possible result in the course.

The task was to create an event location planner that helped organizers of an event to place the chairs in a way that the audience could have a good view of the stage. Students worked on this task individually and presented their solutions in micro exhibitions with 8 students in each exhibition. From each exhibition, the 8 students selected the most interesting application with respect to the design of the graphical user interface and the performance reached by the system. The winners were then presented in a course-wide exhibition and all students were allowed to vote for the best solutions.

At the end, 4 students received prizes and their solutions were placed on the course's web site (<http://web.archive.org/web/20050302111927/kalu.fernuni-hagen.de/1580+82+84/propra2004.html>). Both, novices and advanced students reported that they were amazed by the quality and creativity that was present in the winning solutions and perceived new motivation for their next courses.

At the University of Hamburg, we conduct a similar competition in the second semester course on programming, called *Software Development 2*, since 2007. All students have to implement parts of a film schedule planning software for a real cinema, working in groups of up to six. Towards the end of the semester, the teams have to present their results to each other and elect the best contribution. The prizes are tickets for the cinema in Hamburg.

Related Patterns:

- EXHIBITION focuses more on the presentation and exchange of the students' solutions in diverse areas.
- LETTER OF RECOMMENDATION (Schümmer & Lukosch, 2007) shares the focus on rating other people's contributions. The goal of the LETTER OF RECOMMENDATION is to identify experts for a specific subject or people who have a specific experience. In contrast to this, the ratings in the PEER-RATED COMPETITION use the ratings as a motivational means.
- GOLD STAR (Eckstein et al., 2002) is a more general pattern for praising good students.
- ROUND AND DEEP (Pachel et al., 2009) highlights that the experiences of peer students can augment the content taught in a course. Students should learn from other students' views by understanding the different approaches towards a specific challenge.

2.5 STUDENTS' FEEDBACK FIRST

Context: You are discussing students' solutions.

Problem: Discussions of solutions are often dominated by the teacher. Teachers are often pressed into the role of experts and their feedback is sought first. Students fear to criticize other students' work since they do not always know if their critique is correct.

Forces:

- Students are less confident in the subject than educators.
- Since there are more students than educators, there will be more opinions and different (creative) ideas and impressions present in the class than the educator expects.

Solution: Let students comment on peer students' solutions before providing feedback yourself. Appreciate the feedback and strengthen the confidence of the students in the solution by an explicit summary or confirmation at the end of the discussion.

Technology Support:

In newsgroups, you should give students the time to answer a subject on their own first. Make sure that students know that you will not respond immediately.

Discussion:

Danger spot: Students may get the impression that the teacher has nothing to say about the solution.

Examples: Newsgroup discussion at the FernUniversität in Hagen: Courses at the FernUniversität in Hagen typically have an attached newsgroup where students can ask questions and discuss solutions. Instructors intentionally leave questions unanswered for one or two days to give students the opportunity of providing an answer. Later in the discussion thread, the instructors step in to approve the solution.

Subject	Author	Time
Diskussion Lösungsvorschläge		09.11.2008 14:37
Re: Diskussion Lösungsvorschläge	Frank Heide	10.11.2008 17:30
Re: Diskussion Lösungsvorschläge	Christian Heide	10.11.2008 18:38
Re: Diskussion Lösungsvorschläge	Frank Heide	10.11.2008 20:12
Re: Diskussion Lösungsvorschläge	Christian Heide	11.11.2008 19:06
Re: Diskussion Lösungsvorschläge	Christian Heide	12.11.2008 11:49
Re: Diskussion =?ISO 8859-1?Q?L=F6sungsvorsc...	Frank Heide	13.11.2008 13:19
Re: Diskussion =?ISO 8859-1?Q?L=F6sungsvo...	Christian Heide	13.11.2008 23:12
Re: Diskussion =?ISO 8859-1?Q?L=F6sung...	Frank Heide	14.11.2008 19:34
Re: Diskussion Lösungsvorschläge	Christian Heide	12.11.2008 11:42
Re: Diskussion Lösungsvorschläge	Frank Heide	10.11.2008 20:15
Re: Diskussion Lösungsvorschläge	Frank Heide	10.11.2008 20:30
Re: Diskussion Lösungsvorschläge	Christian Heide	11.11.2008 19:13
Re: Diskussion Lösungsvorschläge	Frank Heide	12.11.2008 07:35
Re: Diskussion Lösungsvorschläge	Christian Heide	12.11.2008 21:29
Re: Diskussion Lösungsvorschläge	Frank Heide	14.11.2008 19:35
Re: Diskussion Lösungsvorschläge	Christian Heide	12.11.2008 11:27
Re: Diskussion Lösungsvorschläge	Frank Heide	14.11.2008 19:40
Re: Diskussion Lösungsvorschläge	Frank Heide	14.11.2008 15:56
Re: Diskussion Lösungsvorschläge	Frank Heide	14.11.2008 19:59
Re: Diskussion Lösungsvorschläge	Christian Heide	16.11.2008 15:36
Re: Diskussion Lösungsvorschläge	Christian Heide	16.11.2008 15:39
Re: Diskussion Lösungsvorschläge	Frank Heide	16.11.2008 20:22
Re: Diskussion Lösungsvorschläge	Frank Heide	16.11.2008 20:27
EA3 - Aufgabe 3	Frank Heide	06.11.2008 12:35
Re: EA3 - Aufgabe 3	Frank Heide	06.11.2008 13:10
EA3-A1	Michael Topp (Student)	16.11.2008 15:22
Re: EA3-A1	Frank Heide	16.11.2008 18:50

Figure 3 : Newsgroup threads in the course on distributed systems.

Figure 3 shows a brief excerpt of a newsgroup discussion that took place in the course on distributed systems. One student initially presented his solution with the goal of getting feedback (on 9th Nov). Instead of providing an instant answer, the instructor waited three days before she commented the solution (post from 12th Nov, 11:27). She also commented the comments made by other students whenever this was required.

Related Patterns:

- PEER CORRECTION also argues that you as a teacher should step back in order to encourage students to make up their mind regarding other students' solutions.

2.6 PEER CORRECTION

Context: You are teaching a large course where students have to solve assignments. The solution process involves creativity; the final result is often a written text that needs to be interpreted by the reader in order to grade it.

Problem: Students expect to receive feedback on their solutions. But you as a teacher have insufficient time to provide detailed feedback on all solutions.

Forces:

- You have no resources for correcting all assignments.
- Students request that their individual solution is corrected by a knowledgeable person.
- Students have gained competencies by creating a solution.
- You want to empower students to critically comment content related to your course's subject.

Solution: Let students give feedback on other students' solutions. Create a prototypical solution and give that solution to the correcting students. Correcting students can use this solution as a guideline for their feedback. If appropriate, you can give the students additional guidelines such as a list of important keywords that should be discussed in the solution. Each student selects a peer student (or is assigned by you to a peer student) and provides feedback according to your solution guidelines. Note that the different roles of the correcting student and the corrected student can also be filled by groups of students. This would mean that a small group of students collaboratively creates a solution and that another group of students then does the inspection.

Technology Support: Technology support can help during the coordination of the correction process. Special attention should lie on support for GROUPS, i.e., the corrected student should be aware of the correcting student and have means for interacting with the correcting student.

An example for a concrete implementation provides the student with functionality for submitting his solution to a pool of correcting students. The correcting student may select this solution for correction or the teacher may assign the solution to the correcting student. From then on, the correcting student and the author of the solution form a COLLABORATIVE SESSION that

allows them to interact. You may decide to equip the students with a collaboration space, e.g., a ROOM, in which they will find the approved solution and advice for performing the grading.

The correcting students need means for adding comments to the solution. This can be handled by SHARED ANNOTATIONS. The final result of the correcting student's review can be structured with a grading template. This especially eases the teacher's task of reviewing the review.

Discussion: The correcting student takes over parts of your responsibility as a teacher. He can do this because he received additional input (the solution guidelines) or because he/she has gone through the assignments in a previous iteration of the course. In both cases, the student benefits from correcting other students' solutions because he/she has to analyze, understand, and critique the solutions produced by peer students. Students also get an impression of other students' approaches for the assignment.

A potential danger spot of the pattern is that the correcting student misinterprets or simply does not understand your solution guidelines. Make sure that a corrected student can contact you if he/she has any doubts regarding the correctness of the feedback.

Examples: At the FernUniversität in Hagen, we applied the CORRECTING STUDENTS pattern in a course on operating systems in the years 2006 to 2009.

Related Patterns:

- GURU REVIEW (Manns & Rising, 2005) proposes to invite well-known experts to review new ideas in an organization.
- FEEDBACK (Eckstein et al., 2002): Feedback is given by the teacher to ensure that the students understand where they are at fault.
- SELF TEST (Eckstein et al., 2002): Students should assess themselves using questionnaires and prepared answers.
- PEER EVALUATION (Derntl, 2004): The PEER-EVALUATION pattern can be considered as a predecessor of our pattern. PEER CORRECTION extends the PEER EVALUATION pattern by proposing a concrete interaction process and highlighting the need for FEEDBACK SCAFFOLDS.

2.7 (RATED) EXHIBITION

Context: You have students working on larger design problems. They work alone or at most in pairs. Each person or pair is working on a different problem. The typical example is several students that are working on their final thesis.

Problem: Students that work very focused on their own problem tend to loose interest in other problems or solutions.

Forces:

- Students construct creative solutions.
- Students can be shy to show the results of their work.

Solution: Let students prepare presentations of their finished work, e.g. in form of a poster. Organize a gathering where the students can (but do not have to!) present their results. Identify and honor outstanding presentations.

This encourages other (younger) students to reflect on the quality of good solutions and thereby better understand what is required by a good solution. Besides presenting the result, you may also ask the students to present their process that led to the result.

Technology Support: In co-located settings, you may create an exhibition where students present their results on flip-charts, posters, etc. In distributed settings, you may ask the students to upload their solutions to a Wiki. If the solution includes a presentation, you may also ask the students to create electronic versions of their presentation using presentation systems like slidecast. Encourage the students to comment other students' solutions.

Since the discussion should have time to reflect, you may use a forum attached to each solution where the solution can be discussed.

Discussion: You need to decide when you make the solutions available. If you teach the same class in subsequent years, you may use the solutions of previous years' students and make them available before the solution is due. However, this may hinder the development of new / different solutions.

Ensure that you explain the added value of creating a presentation of their work for a wider audience.

Examples:

In the course Designing Cooperative Systems taught at the Universities of Applied Science Dortmund and Cologne/Gummersbach, the students were asked to successively build a prototype for a cooperative system. While the lecture evolved, students were frequently asked to show their intermediate solution to others. This bound the lecture to the cases created by the students and helped the students to better understand the subject. At the end of the course, the students created a SlideCast presentation of their prototype and all prototypes were finally visited together on slidshare (<http://www.slidshare.com/>) during a virtual lecture session where students provided their comments both in written form using the course's mailing list and orally within a telephone conference (Figure 4).

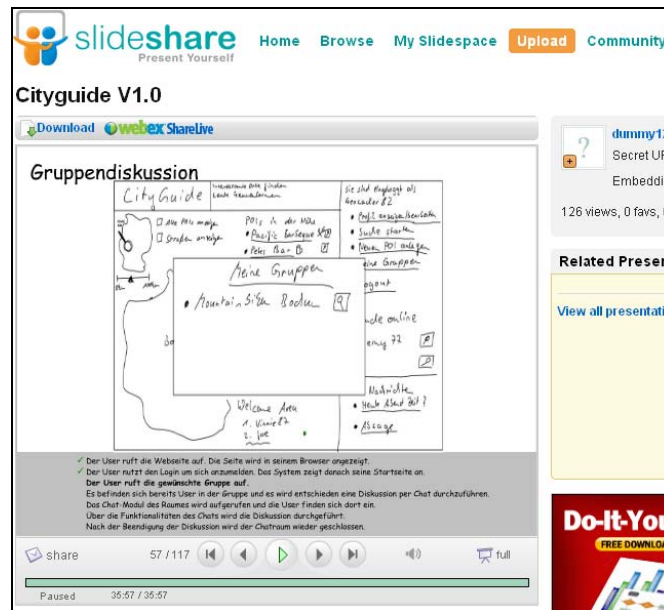


Figure 4: Using a SlideCast as one way to exhibit the students' results.

In the Department of Informatics at the University of Hamburg, once every year students are asked to present the results of their thesis projects at the EXPO, a half day event that is open to the public and actively visited by the members of the Department (staff and students). Typically students prepare posters, but sometimes they also prepare demos. The best three presentations win a prize (money).

Related Patterns:

- PEER RATED COMPETITION has a special focus on the peer rating. While rating can also be an aspect of the EXHIBITION, the main focus of an EXHIBITION should rather be the exchange of experiences.
- HALL OF FAME (Schümmer & Lukosch, 2007) displays successful users of a community. In an educational context, we prefer to rate the students' solutions.
- HOMETOWN STORY (Manns & Rising, 2005) discusses how new ideas can be exchanged in organizations. The authors propose to organize an informal highly interactive session in which new ideas are presented and shared among practitioners.
- STUDENT ONLINE PORTFOLIOS (Eckstein et al., 2002): Same direction but focus on providing a place for publishing results. We assume that there are additional requirements, especially that the exhibited artifacts should invite peer feedback.
- Classroom display (Pachler et al., 2009) also argues for an event at which student solutions are made accessible to peer students. The pattern concentrates on the design of an e-learning environment for supporting the exchange of the solutions. Rating is not discussed in the Classroom Display pattern.

3. Conclusion

This paper is intended as a systematic collection of best practices for gaining and handling feedback by students. We consider it as a first step towards a larger collection of patterns that will encourage students to become active and critical partners in the next generation of educational settings. In these settings, teachers become facilitators of learning activities. We experienced that feedback plays an important role in these settings and hope that the patterns of this paper can make teachers more aware of the importance of feedback.

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