

Formative e-Assessment: case stories, design patterns and future scenarios

Yishay Mor¹, Harvey Mellar¹, Norbert Pachler², Caroline Daly²

1: London Knowledge Lab

2: WLE Centre for Excellence, Institute of Education, London

Abstract

This paper presents findings from the JISC funded project ‘Scoping a vision for formative e-assessment’ (FEASST). The project was motivated by the increasing recognition of the importance of formative assessment and the need to identify effective strategies for incorporating it into e-learning. We were particularly interested in the human-centric, social dimensions of e-assessment. The project used the participatory pattern methodology to engage a group of practitioners in developing case studies of formative e-assessment across a range of settings (from Primary to Higher Education) through a series of Practical Enquiry Days. We abstracted design patterns from these cases and analysed the outcomes against the literature. Patterns were subjected to the scrutiny of a group of software developers who used them as the basis for pedagogical and technical scenarios of use. Finally, the case studies and the design patterns were mapped to a domain map. This paper provides an overview of the project and highlights an illustrative number of patterns.

Introduction

The project entitled ‘Scoping a vision for formative e-assessment’ (FEASST – <http://feasst.wlecentre.ac.uk/>) was commissioned by the UK Joint Information Systems Committee (JISC) (for the project report see Pachler, Mellar, Daly, Mor, Wiliam, & Laurillard 2009). It was led by the WLE Centre for Excellence and the London Knowledge Lab at the Institute of Education, London, and ran from June 2008 to January 2009. The project adapted the participatory pattern methodology (Winters & Mor, 2009; Finley et al, 2009; Mor & Winters, 2008), combining a desk-based review of the theory and practice in the field of formative e-assessment with a series of practical enquiry days (PEDs). These PEDs brought together educational practitioners from various higher education institutions in the UK, and guided them through a process of collaborative reflection. The main outcomes of this process were a series of ten case stories and ten design patterns (though the relationship between cases and patterns is not one-to-one as we also incorporated a number of other case studies and patterns from outside the project into our analysis as we will describe below).

We initially identified ten potential case stories, each illustrating a different aspect of the domain. Five of these were chosen to be further elaborated. The choice was driven partially by the quality of the cases, partially by the issues that the literature indicated as critical, and partially by PED participants’ preferences. These cases are described in Pachler, Daly, Mor and Mellar (2009), and will not be discussed further in this paper.

Four design patterns were derived directly from these case stories: **CLASSROOM DISPLAY**, **FEEDBACK ON FEEDBACK**, **SHOWCASE LEARNING** and **TRY ONCE, REFINE ONCE**. Apart from the first, these were all identified and articulated by PED participants and only later refined by the project team. The names of the original authors are noted below. Six more previously published patterns were found to resonate with the case stories and interact with the four new patterns: **NARRATIVE SPACES**, **OBJECTS TO TALK WITH**, **SOFT SCAFFOLDING** (Mor, in press), **ROUND AND DEEP** (Eckstein, Manns, Sharp and Sipos, 2003), **WEAR YOUR SKILLS ON YOUR SHIRT** (Schadewitz, 2008) and **USE MY STUFF** (Kohls, 2008).

Theoretical rationales for the design patterns called on a range of literature, particularly on work in the area of formative assessment by Black and Wiliam (2009) and on Laurillard’s Conversational Framework (Laurillard, 2002)

Background

Formative e-assessment

There are widely differing theoretical emphases in the literature on formative assessment and, within e-assessment, a tendency to conflate formative and summative assessment, within a view of ‘adaptivity’ as a core component of e-assessment processes. Some examples of formative e-assessment can be argued to be simply serial summative assessment, and formative assessment appears often to be equated with ‘low stakes’ assessment, or ‘practice’ assessment.

However, for the purposes of our study we define formative e-assessment as the use of ICT to support the iterative process of gathering and analysing information about student learning by teachers as well as learners and of evaluating it in relation to prior achievement and attainment of intended, as well as unintended learning outcomes, in a way that allows the teacher or student to adjust the learning trajectory. Black and Wiliam (2009) conceptualise formative assessment in terms of five key strategies:

1. Clarifying and sharing learning intentions and criteria for success;
2. Engineering effective classroom discussions and other learning tasks that elicit evidence of student achievement;
3. Providing feedback that moves learners forward;
4. Activating students as instructional resources for one another; and
5. Activating students as the owners of their own learning.

They set these key strategies out in the way shown in Figure 1, which we adopted as a map of the domain of formative assessment.

	Where the learner is going	Where the learner is	How to get there
Teacher	Clarify and share learning intentions	Engineering effective discussions, tasks and activities that elicit evidence of learning	Providing feedback that moves learners forward
Peer	Understand and share learning intentions	Activating learners as learning resources for one another	
Learner	Understand learning intentions	Activating learners as owners of their own learning	

Figure 1: Domain map of the key aspects of formative assessment (Black and Wiliam, 2009)

No assessment technology is in itself formative, but almost any assessment technology can be used in a formative way. This observation is in line with a socio-technical view of educational systems, which sees the technological dimensions (e.g. speed, storage capacity, processing, communication, construction and representation and mutability) as inseparable from the pedagogical parameters (e.g. verbal/electronic/synchronous/asynchronous interaction between key players which brings about changes in concepts or skills).

A key issue of contention in thinking about formative e-assessment is the role of the ‘teacher’ and to what extent their role includes adaptation of pedagogy, to what extent is ‘monitoring’ and ‘managing’ assessment processes formative in terms of transforming the learning environment or pedagogy in response

to evidence of learners' progress? The role of 'evidence' is core (how it is used, generated, by whom/what and affecting whom/what). When thinking about assessment as a noun, it is useful to distinguish the event which generates the evidence (e.g. a test as 'an assessment') and the evidence itself (e.g. the score). Another core feature is learner self-regulation (Nicol & Macfarlane-Dick 2006), linked to motivation and emotional factors which affect learners' engagement with feedback.

Our perspective on the use of technology to support formative assessment has also been strongly influenced by Laurillard's Conversational Framework (Laurillard, 2002). We view learning as 'conversational', consisting of a series of iterative cycles of interaction between teacher/learner/peers in a variety of combinations which may make use of technologies to greater or lesser degrees.

However, we wish to propose the concept of Moments of Contingency as the pivotal factor in formative assessment: critical points in the teaching and learning process where the flow of instruction cannot be predetermined (Black and Wiliam, 2009). Moments of contingency contain within them the scope for learners' understanding to be 'otherwise'. The technology itself does not create these moments; they are dependent on teachers' and learners' actions, but for technology to perform formatively, it needs to acknowledge and support these moments.

Methodology

The project adapted the participatory pattern methodology (Winters & Mor, 2009; Finley et al, 2009; Mor & Winters, 2008). This methodology engenders a process by which communities of practitioners collaboratively reflect on the challenges they face and the methods for addressing them. The outcome of the process is a set of case stories, design patterns and future scenarios situated in a particular domain of practice. The standard methodology centers on a series of three workshops, supported by a set of techniques for structured storytelling and systematic analysis of participants' experiences (Figure 2).

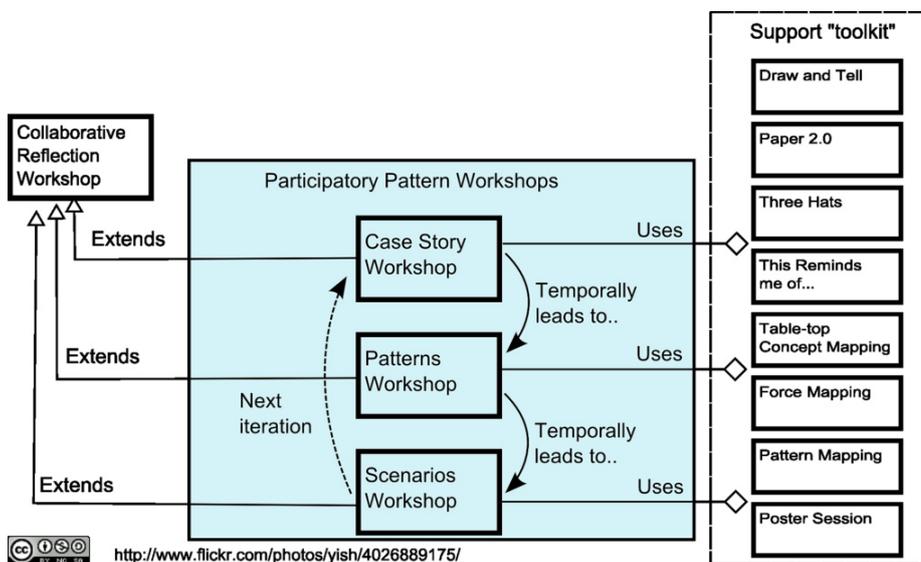


Figure 2: The Participatory Pattern Workshop methodology

This methodology was adapted to the specific conditions of the project, resulting in a series of five practical enquiry days (PEDs). These PEDs brought together educational practitioners from various higher education institutions in the UK, and guided them through a process of collaborative reflection. The main outcomes of this process were a series of ten case stories and ten design patterns. Practitioners were prompted to recount their experiences of using formative e-assessment as case stories, and discuss these with their peers. The construction and discussion of these narratives were scaffolded by a set of tools and activities to extract transferable and verifiable elements of design knowledge in the form of design patterns. The initial development of the patterns from the case stories was done by the practitioners themselves (who were not initially familiar with the pattern approach) in workshops supported by the project team (who were familiar with the pattern approach). As will be seen in the evaluation section below some practitioners expressed a desire for more training in the pattern approach. The patterns were then refined by the whole project within the project wiki. These patterns were then applied to novel problems from real situations by both teachers and software developers to develop use scenarios.

Evaluation

The project methodology was subject to an evaluation by a researcher external to the project team. First, the evaluation carried out a review of the aims of the design patterns methodology. These were discussed with researchers on the project responsible for the design and implementation of this methodology. Second, a review was carried out of one of the workshop days, and of the project web site. Field notes were taken to identify how the methodological design constructs a context for the description of formative e-assessment and how this takes place in practice. A focus of this aspect of the evaluation was whether the methodology reached its aims in allowing the generation of ‘new’ descriptions (e.g. descriptions which address limitations with the existing research on formative e-assessment). Third, practitioners who took part in the project were asked to complete e-mailed questionnaires focusing on how the methodology structured their participation in the project. Again, here the focus was on whether the methodology reached its aims in foregrounding particular ‘voices’, notably the voices of practitioners. The advantages and disadvantages of this methodology in documenting good practice were evaluated in the light of other possible methods for doing this. The evaluation was not intended to be distant and critical, but supportive of future research. The aim therefore was to make judgments about the methodology’s internal consistency (the extent to which it realised its aims), rather than its external consistency (its value compared to other methodologies), and to highlight how this methodological approach might be enhanced in any future projects. That is, the evaluation focused on raising questions about the methodology as it is practiced, with a view to enhancing this practice over time.

Responses from the end-user questionnaires suggested that the use of the designs patterns methodology in

the project had several significant benefits. It facilitated networking, productive discussions between groups of people with similar interests, the analysis of values underpinning practice, the sharing of practice, and the codification of practice in a way which many respondents found generative.

However, a number of issues were raised which suggested the importance of reconsidering the claims made about the methodology. One claim was that the methodology addresses a problem in existing work, identified as the gap between theory and practice. It is said to do this by facilitating collaboration between practitioners, researchers, software developers and other parties. In this project, the distinctiveness of these various parties was not always apparent, with participants moving across these different domains in their varied professional capacities. It might be suggested that future projects apply more narrowly-defined criteria for the selection of participants, so that each may be identified more clearly as representing a distinct constituency, but in higher education, this is unrealistic, since many teaching practitioners also do research, and see themselves as researchers. More generally, however, the responses suggest the difficulty of maintaining a clear dividing line between theory and practice, not least because this tends to homogenize practice. A striking feature of the responses was the diversity of views about what is constituted by '(formative e-assessment) practice', and the values/theories which underpinned this diversity. The argument, put forward by one respondent, that the design patterns methodology focuses on regularizing practice, rather than celebrating diversity and innovation, might be read as a reaction to the endeavour to separate theory from practice in the way the methodology was conceived and practiced; for it frames practice as untheoretical, in distinguishing practice from theory in terms of regularity/routinisation. In this project, though, many of the practitioners had theorized formative e-assessment practice, and were interested in innovation rather than routinisation. Overall, this was possibly of benefit to the project. This suggests that there might be some benefit in revisiting the claim the methodology addresses the problem of a gap between theory and practice, either with a view to specifying more clearly how it should do this in practice, or by re-examining whether this is a/the real problem.

A second claim made about the methodology was that the design patterns generated within the project would be 'immediately implementable' in software, although were not the same as software specifications – three out of four of the software developers who responded to the questionnaire disagreed with the claim that the design patterns they encountered at the workshop would or could be 'immediately implementable'. However, they also stated that this did not invalidate the methodology, since the benefits of this were different, and related to the opportunity for developers to learn more about the domain in which they worked and to develop scenarios they could use with educators to structure a discussion about a systems implementation. It should be emphasized that the developers were positive about their participation in the workshop, with two respondents indicating their intention to use the same methodology in their own work. This suggests that the issue here is with the claim made about how the design patterns can be put to work – rather than with their value per se.

The responses also suggested ways in which the design patterns methodology might be practiced differently to overcome certain limitations:

- A number of respondents indicated that they would have appreciated ‘training’ in the methodology, and that this would have enabled them to participate more fully in the PED. Although there was significant background documentation on the project wiki about the methodology, this may not have been reviewed by PED participants prior to their attendance. In future, there might be some benefit in considering ways of inducting participants into the methodology more explicitly, as well as into its values/the values of the practice it is intended to foster. This could provide a firmer basis for participation, by clarifying the basis on which people are participating, and the status of the work to be produced (i.e. the status of the design patterns with respect to ‘implementation’). A result of this lack of induction into the methodology was that patterns were written with different styles and with different attitudes, particularly with respect to the starting point for the patterns. Most of the patterns derived in this project started from a statement of a problem, but practitioners sometimes challenge this approach and prefer to describe the benefits to be derived from the solution rather than describe a problem – an example of this is the **SHOWCASE LEARNING PATTERN** below.
- The technology did not fully support the sharing of practice, with access to the wiki space proving a real hurdle in some cases. In future, it might be worth considering whether more reliable/accessible technologies can be used.

Patterns

This section presents ten design patterns derived from the cases that we analysed. Each pattern represents a typical process of formative assessment which could be supported by software tools. This list is neither comprehensive nor definitive, but it represents a broad sampling of the domain. Four new patterns which were developed in the course of the project are presented in full detail. These are: **CLASSROOM DISPLAY**, **FEEDBACK ON FEEDBACK**, **SHOWCASE LEARNING** and **TRY ONCE, REFINE ONCE**. Six other existing patterns were found to resonate with the case stories and interact with the four new patterns, suggesting they should be included in the emerging pattern language. These are included as ‘thumbnails’.

Most of the patterns identified pertain to the design of interactive spaces for learning. **NARRATIVE SPACES**, **OBJECT TO TALK WITH**, **CLASSROOM DISPLAY** and **WEAR YOUR SKILLS** refer to the design of collaborative or conversational spaces, whereas **SOFT SCAFFOLDING** is relevant to individual learning as well. Other patterns relate to the design of activities, which could be implemented in either physical or virtual environments. These include **USE MY STUFF**, **FEEDBACK ON FEEDBACK**, **ROUND AND DEEP**, **SHOWCASE LEARNING**, and **TRY ONCE, REFINE ONCE**. The **THREE HATS** pattern which is used as a part of the methodology is also in this class.

All the patterns presented here include contributions from multiple authors. Each of the four new patterns (listed first in the table below) was initially developed in one or more of the Practical Enquiry Days in the FEASST project, and then refined through several rounds of discussion in the project wiki, and then edited for greater consistency of presentation by the authors of this paper. The main elements of the patterns remain as developed by the original authors. The original authors released them under a creative commons Attribution-Non-Commercial-Share Alike 2.0 UK: England & Wales license. The authors are listed in each pattern, and this attribution should be retained by any user of the patterns. The patterns developed within the FEASST project and the supporting cases are available on the project wiki - <http://patternlanguagenetwork.myxwiki.org/xwiki/bin/view/Groups.FormativEAssessment/>.

CLASSROOM DISPLAY	Share learners' work with a trusted audience. Create a space within the learning environment where learners' works can be displayed side by side.
FEEDBACK ON FEEDBACK	Feedback given to learners should provide opportunities to improve the learning experience. It should comprise constructive feedback to improve learning as well as socio-emotive feedback. Tutors in large courses often resort to grading devoid of effective feedback. To support them in improving their feedback, they need effective feedback on the feedback they give.
SHOWCASE LEARNING	Publicly celebrate student work.
TRY ONCE, REFINE ONCE	A two-step question-answering system which encourages students to consider their initial answers to skills-based questions very carefully, and, on receiving feedback on their errors, to give as much thought to the refinement process.
NARRATIVE SPACES	Constructing narrative is a fundamental mechanism for making sense of events and observations. To leverage it, we must give learners opportunities to express themselves in narrative form. (Mor, in press).
OBJECTS TO TALK WITH	When we talk we point at objects. When we talk on-line we should be able to do so too. When providing tools for learners to discuss their experience, either as part of the activity or at a reflective meta-level, allow them to easily include these artifacts in the scope of their discussion. (Mor, in press).
ROUND AND DEEP	Use the students' experiences to complement your own and provide the alternative perspectives required. (Eckstein, Manns, Sharp and Sipos, 2003)
SOFT SCAFFOLDING	Scaffolding is a term commonly used in educational design to describe structure that directs the learner's experience along an effective path of learning. Technology should be designed to scaffold learners' progress, but an interface that is too rigid impedes individual expression, exploration and innovation. (Mor, in press)

WEAR YOUR SKILLS ON YOUR SHIRT	Use virtual appearance to reflect abilities. The visual representation of your avatar shows the extent of your skills. Skills can be gained or given, and be personal skills or avatar skill. (Schadewitz, 2008)
USE MY STUFF	Use learner supplied artifacts as raw materials for new learning activities. (Kohls, 2008)

CLASSROOM DISPLAY



Authors

Yishay Mor, Norbert Pachler, Harvey Mellar, Caroline Daly

Summary

Share learners' work with a trusted audience, by creating a space within the learning environment where learners' works can be displayed side by side.

Problem

Using learners' work as part of the instructional activity has several advantages, it:

- Rewards participation;
- Makes learning more meaningful, by relating it to learner's personal experiences;
- Allows the teacher to align instruction with students' perspective and current state of knowledge.

However, doing this poses some challenges:

- The teacher needs to have learners' works collated in a single easy to access location, so that she can draw on them as needed;
- Learners may feel uncomfortable about presenting their work in a public space;
- There may be legal or other restrictions on sharing work.

Context

This is most suited for small to medium size classes, blended learning, and anywhere where learning has an element of production/construction of visual artifacts. However, it could be adapted and extended to a very wide range of settings.

Solution

Create a space within the learning environment where learners' works can be displayed side by side.

Works can be arranged thematically, chronologically, as an index or as a visual narrative.

The size and location of the display should allow learners and teacher to view a collection of learners' work simultaneously, and refer to them in the course of the learning activity.

The display should be visible for all learners, but may need to be concealed from the outer world. If not, it should at least function as a Front Garden; a buffer between public and private spaces.

Related patterns

Extends: **USE MY STUFF, OBJECTS TO TALK WITH.**

Contrasts: **SHOWCASE LEARNING.**

Supporting cases

Como: mobiles + flickr = co-reflective practice

The CoMo project was situated in a veterinary training hospital at the Royal Veterinary College. It focused on enhancing collaborative activities through the use of mobile phones. Students were engaged in practical work as part of their training whilst on surgical rotations. The task for the students was to capture instances of practice on a mobile phone, and the images taken were then used in group discussion sessions with their tutor.

Streaming Theatre

A course was jointly taught at two institutions (Warwick and Amsterdam) on the cultural aspects of national theatre. Seven undergraduates from each institution worked both as a single group and as separate pairs (one from each institution) using: a project blog, a website, online editing space, videoconferencing, forums and email. The modules were intended to articulate the specific national characteristics of theatre in the two countries and thereby identify the differences in cultural traditions, and the role culture plays in developing a national theatre,

Rationale

This pattern is an example of the key formative assessment strategy 'activating students as instructional resources for one another' (Black and Wiliam, 2009). This pattern can be seen as linking with well-established co-constructivist theories by which learners build knowledge by pooling their individual knowledge resources, making these available for others and working collaboratively to augment existing ideas and understandings. The formative processes here are essentially socio-interactive, related to the types of exchange which take place around the 'signs', between learners and between teachers and learners. This approach has its origins in Vygotskian perspectives on the socio-psychological aspects of learning within social contexts as negotiating meanings, and is premised on the need to interpret 'signs' (commonly words but can also be images, diagrams – all forms of 'representation' – see Jewitt and Kress, 2003) by which individuals represent internal conceptualizations. Making learners' work the explicit focus of shared

learning approaches formalizes a core learning process which involves the teacher and peers in negotiating meanings. An important formative assessment aspect of the pattern is also the suggestion that the teacher modifies their pedagogy in response to learning about the students' current state, allowing the teacher to align instruction with students' perspective and current state of knowledge'.

Learners (particularly younger learners) might require explicit support in coming to understand the processes involved in sharing and responding to each others' products, and teachers may need to explicitly and gently induct learners into the process of sharing work and giving and receiving feedback. In these interactions, teachers would need to focus not just on the feedback criteria but also on probing learners' emotional reaction to the feedback (both positive and negative).

FEEDBACK ON FEEDBACK



Authors

Linda McGuigan, Denise Whitelock, Norbert Pachler, Harvey Mellor, Caroline Daly, Andrew Rosenthal.

Summary

To support tutors in improving their feedback to students, they need effective feedback on their feedback. Tutors particularly those in large courses often resort to grading devoid of effective feedback. Feedback given to learners should provide opportunities to improve the learning experience, and should comprise constructive feedback to improve learning as well as socio-emotive feedback.

Problem

Effective feedback needs to:

1. Alert learners to their weaknesses;
2. Diagnose the causes and dynamics of these;
3. Include operational suggestions for opportunities to improve the learning experience;
4. Address socio-emotive factors.

Tutors may be aware of all these, but still need guidance in structuring their feedback. Often, for lack of knowledge or limited resources, they resort to feedback which only covers the first requirement. In order to improve tutor feedback, they need to be provided with effective feedback on the feedback they give. This

should be provided as close as possible to the event, in order to allow them to adapt their strategies and recover from their mistakes. However, in large courses with many tutors, this is a challenge.

Context

This pattern is appropriate in contexts with the following characteristics:

- Large scale, technology supported courses: many tutors instructing many students;
- Topic of study is subject to both grading and formative feedback;
- Tutors need support in providing effective feedback, but resources for individual mentoring are not available;
- Feedback is mediated by technology that allows it to be captured and processed in real time (this requirement can be relaxed).

Solution

Embed a mechanism in the learning and teaching system that regularly captures tutor feedback, analyses it, and presents the tutors with a graphical representation of the types of feedback they have given. Ideally, this should also include constructive advice as to how to shift from less effective to more effective forms.

In computer-supported environments (e.g. VLEs), this mechanism could be integrated into the system, providing tutors with immediate analysis of their feedback, as well as long-term aggregates.

In unmediated environments (e.g. face to face classrooms), the same mechanism can be implemented by cross-observations between tutors, using a printed feedback tracking form.

Supporting cases

- **Open Mentor**

Open Mentor is a system that was built to assist tutors at the Open University to provide constructive feedback to students in order to help them improve their work and also to give socio-emotive feedback as well. Open Mentor allows tutors to submit their comments on assignments and gives them feedback, showing a categorization of the comments they had made, and comparing this with an 'ideal' profile for a student obtaining a similar mark.

- **Open Comment**

This project constructed some simple tools in the form of Moodle extensions that allow an author to ask for free-text response questions that can provide a degree of interactive formative feedback to students. In parallel with this was the aim to begin to develop a methodology for constructing such questions and their feedback effectively, together with techniques for constructing decision rules for giving feedback.

- **Developing Formative assessment for H812: Postgraduate Certificate in Academic Practice**

This project developed formative e-assessments for the course Postgraduate Certificate in Academic

Practice. The assessments developed consisted of interactive quizzes with feedback.

- **AA308 Case Study: Experiences of a course team producing formative e-assessment for the first time**

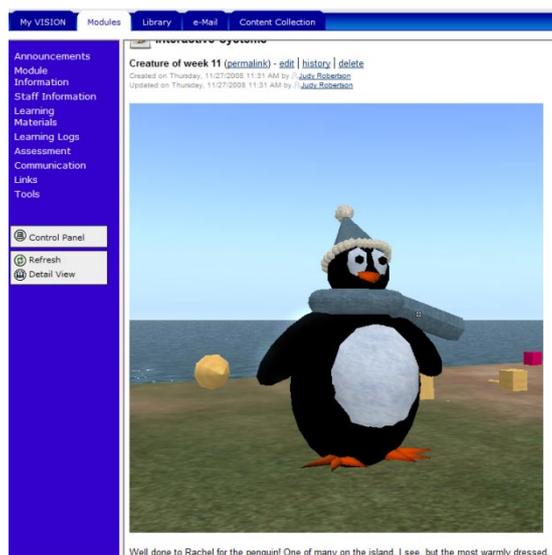
This project developed formative e-assessments for Philosophy, course and an exploration of the attitudes of the course team towards the use of formative e-assessment.

(These cases were developed by Denise Whitelock at the Open University, see Whitelock, D. M. 2007 and Whitelock, D., Watt, S. N. K., Raw, Y., & Moreale, E. 2003).

Rationale

This pattern is an example of the key formative assessment strategy ‘providing feedback that moves learners forward’ (Black and Wiliam, 2009), though in this case the attention is directed at teacher adaptation of pedagogy, which is an important (if somewhat neglected) aspect of formative assessment: ‘An assessment activity can help learning if it provides information to be used as feedback by teachers, and by their students in assessing themselves and each other, to modify the teaching and learning activities in which they are engaged. Such assessment becomes formative assessment when the evidence is used to adapt the teaching work to meet learning needs’ (Black et al 2003 p. 2). There may be limited or no immediate gains for learners in some contexts, where teacher learning needs to adapt to more complex types of change. Although immediacy is a feature of ‘moments of contingency’ what is ‘contingent’ may also have longer-term developmental consequences for pedagogy. Both ‘immediacy’ and ‘long- or medium-term change’ can be achieved in this pattern. The pattern incorporates a graphical representation of the teacher’s feedback strategies because this is something that might be (indeed has been) readily implemented technologically, but it might be just one of a range of strategies used to provide feedback, and, indeed, if it stopped at merely providing graphical feedback then this approach would be in danger of undermining the message about effective forms of feedback since it would simply be providing tutors with feedback alerting them to their weaknesses without incorporating any of the other forms of feedback that were identified earlier.

SHOWCASE LEARNING



Authors

Judy Robertson, Heriot Watt University, Edinburgh

Summary

Publicly celebrate student work.

Problem

Often in university settings, learning is hidden behind closed classroom doors, stored in private file spaces, or locked away in a VLE. In contrast, primary school learning environments celebrate their students' work by literally papering the walls with it, creating a more motivating and fun environment for teachers, learners and visitors. This pattern is about celebrating student learning in university spaces, either digitally or physically. It shows the students that we value good work, and they should be proud of it. Issues which should be considered are privacy and inclusion. Pattern parameters include the mixture of technologies used, who selects the content, the duration of the display, and the size of audience with whom you wish to share the students' work.

Context

You could use this pattern in the context of university learners in conjunction with learning technology such as a VLE/ Second Life, blogs. It works within computer science, and physical versions of this pattern are common in art or design schools.

Solution

There are a number of parameters which you can use to customize this pattern to a specific situation.

- Technology mixture: at one end of the spectrum you could make a paper 'good work' board to hang on the wall of your teaching space. At the other end you could have a dynamic display of

digital content on the university web space. Or you could have a digital display on physical screens in the university department, for example in social spaces or as screen savers in computer labs.

- Content selection: who has ownership of this system? Do you want it to be staff lead as a way of modeling good work and encouraging students to emulate it? Or do you want it to be student led, where students have responsibility for selecting, filtering and maintaining content for their peers? This would be suitable for encouraging a student sense of community.
- Context of display: where will it take place, and for how long? Options include a quick demo of student work in a lecture, pointing out good work in the lab, making a display for a class wall which lasts for a semester or a more permanent display for a department exhibition space.
- Medium: What will you display and how will it be presented? Will it be an oral presentation by students? Will it be photos or screen shots of student work? Written work? Physical artifacts?
- Audience size: least threatening for students is displaying to a small group of friends within the class. The most stressful is likely to be a public display (such as a degree show). Points on the continuum include displaying something to the whole class, or showing work within the walls of the department.

Examples include:

- End of term showcase in which prizes are given for peer nominated work, nominated students present their work, and the staff give a prize to the best.
- ‘Star of the week’ when a lecturer mentions a student who did good lab work during the week in a lecture, pointing out what they have done well.
- Departmental web pages which show excerpts from work of current students.

Consideration needs to be given to issues of inclusion and privacy. In terms of inclusion: in celebrating students’ work, what does this mean for the students whose work is not showcased? They will perhaps feel left out or undervalued, or resent those whose work is shown. This can be addressed partly by taking care how the content for the showcase is selected. Will only the best work be selected, or work where the student has improved recently, work where students demonstrate attributes or skills such as good problem solving, patience, or the willingness to help others? It is certainly important to establish with the students an atmosphere where they have positive feedback from the staff anyway, to reduce the feeling that their work is not good. Another approach is to invite students to peer nominate content, as other students may be more aware of their classmate’s good efforts than the staff. In terms of privacy: When selecting content, it is necessary to think about whether the students will react well to having their work displayed. There needs to be a safe classroom environment where the students feel encouraged but not pressured. Students may

feel stressed if they have to verbally present work within a large class, but may feel more relaxed if their work is shown on a display. They are more likely to feel worried when presenting outside the class group to visitors or other year groups of students.

Related patterns

Uses: **GOLD STAR** (Bergin, 2000a)

Supporting cases

Creature of the week

A large class of first and second year computer science students on a programming module called 'Interactive Systems'. The students' assignment was to create a virtual pet in Second Life. This involves 3D modeling and programming skills. The intended effect was to engage and motivate the students, to show examples of good work which others could learn from, show students their work is valued, and also to build a sense of community.

Rationale

This pattern is an example of the key formative assessment strategy 'activating students as instructional resources for one another' (Black and Wiliam, 2009). The conceptual understanding of learners is made tangible and interrogable, normally through processes of reflection and meta-reflection, and opportunities are created for both teacher and learner to take action and make deliberate decisions. In terms of the Conversational Framework (Laurillard 2002) this pattern relates to bridging the gap between the learner's and the teacher's conceptions: visual representations externalize the learner's conception and provide a basis for learning conversations between the learner, teacher and peers to take place. This pattern contains several features which potentially meet Nicol's (2007) 'principles of good feedback practice':

- Encourages positive motivational beliefs and self-esteem;
- Encourage interaction and dialogue around learning;
- Facilitates the development of self-assessment and reflection in learning;
- Helps teachers adapt teaching to student needs.

TRY ONCE, REFINE ONCE



Authors

Aliy Fowler, Yishay Mor Norbert Pachler Harvey Mellar Caroline Daly Judith Jakes

Summary

A two-step question-answering system which encourages students to consider their initial answers to skills-based questions very carefully, and, on receiving feedback on their errors, to give as much thought to the refinement process.

Problem

In a skills-based course lack of immediate feedback can lead to fossilization of errors and misconceptions but providing immediate feedback in an iterative fashion can also hinder effective learning since students are able to ‘grope their way’ step-by-step to a correct solution without necessarily having to think seriously about each answer.

Context

The context is skills-based learning situations where multiple misconceptions in exercise answers are possible. Particularly applicable to foreign language learning, but should also work for other skills-based fields. The range of assessment types this approach might be suitable for would be those in which student answers can contain multiple errors, for which detailed feedback indicating the source and type of each of the errors can be generated, without revealing exactly what must be done to correct them.

Solution

Students are posed questions of a type which elicit answers that can contain multiple errors. If a student’s answer is entirely correct a mark of 100% is awarded. If their answer contains errors, a mark is given which contributes to a percentage of the total mark for the question, along with detailed - yet generic-

feedback on the location and type of the errors. Students are then permitted a second attempt in which to refine their answer. The mark for the 2nd attempt contributes to remaining percentage of the total mark for the question. Feedback on any remaining errors is also given, along with the correct answer(s). No further attempts are permitted.

The two-attempt limit and unequal weighting of the marks for the initial attempt and the refined answer are crucial to this pattern, since they prevent students from adopting a mindless iterative approach, in which they begin with a ‘stab in the dark’, and then use the system/tutor to guide them step-by-step to the correct answer (often via numerous minimally-altered attempts).

The marks ratio can vary, but showing a distinct favoring for the first attempt works best - ensuring that students give careful consideration to all components of their first answer, and equally careful consideration to improving it in the face of the diagnostic feedback. If the ratio is skewed too far in favor of the second attempt then students tend to exhibit less care over the construction of their initial answer. If the ratio is skewed too far in favor of the first attempt then students are less inclined to try and correct non-perfect answers.

The marks ratio could be adjusted according to the amount of information in the feedback. The less information in the feedback the higher the second mark should be, the more information in the feedback the less the second mark should be.

Related patterns

GRADE IT AGAIN, SAM (Bergin, 2000b)

Supporting cases

String comparison in language learning

Undergraduate students taking a Spanish module need to practice written language independently and receive feedback on errors in order to improve their language skills. The large numbers make it time-consuming for tutors to provide detailed individual feedback. The students answer randomly-generated, translation-based questions, grouped into exercises which focus on specific areas of grammar. A bespoke string (sequence) comparator was designed which rather than parsing the input uses fine-granularity sequence comparison to compare correct language strings to a user’s answer. With this technique generic - but detailed - feedback is always given, no matter how confused the user's answer is. If an answer contains errors the student is given a second attempt in which to correct the submission based on the feedback received.

Post 16 string comparison

This case describes the use of the ‘string comparison’ approach to language teaching at post-16 for AS and

A2 level students. It is used for grammatical consolidation and for whole-sentence translation. This case focuses on the need for students to practice written language independently and receive feedback on errors in order to improve their language skills.

Rationale

This pattern is an example of the key formative assessment strategy ‘activating students as the owners of their own learning’ (Black and Wiliam, 2009). A particular clue as to why the assessment regime proposed in this pattern might work is provided by Hattie and Timperley (2007) who write: “The degree of confidence that students have in the correctness of responses can affect receptivity to and seeking of feedback. Kulhavy and Stock (1989) noted that if confidence or response certainty is high and the response turns out to be a correct one, little attention is paid to the feedback. Feedback has its greatest effect when a learner expects a response to be correct and it turns out to be wrong. As Kulhavy and Stock noted, “high confidence errors are the point at which feedback should play its greatest corrective role, simply because the person studies the item longer in an attempt to correct the misconception” (p. 225).” Because a high percentage of the marks will be given for the first attempt the students are likely to give answers in which they have a considerable degree of confidence and so, if the answer is then found to be incorrect, then this is a situation where the feedback will be most effective.

This pattern contains several features which meet Nicol and Macfarlane-Dick’s (2006) principles of good feedback, which enable learners to ‘make evaluative judgments about their own work’ (Nicol, 2007). In the argument made by Nicol and Macfarlane, learner self-regulation is fundamental within formative processes. This pattern meets the following ‘principles’ by which learner self-regulation is achieved

- Helps clarify what good performance is;
- Facilitates the development of self-assessment and reflection;
- Delivers high quality info to students about their learning;
- Encourages positive motivational beliefs and self-esteem;
- Provides opportunities to close the gap between current and desired performance.

In the CALL exercises from which this pattern was drawn (Fowler, 2006; 2008), the ratio of marks between the first and second answer attempts was 3:1. This proved optimal for the original situation but is obviously easily altered for other assessment types. The **TRY ONCE, REFINE ONCE** approach led not only to marked improvements between first and second answer-attempts, but more importantly to demonstrable improvement in accuracy (and speed) of answering as users progressed through exercises. In other words, students became able to formulate their foreign language sentences more accurately and with greater rapidity, which is a good measure of success in language learning. The CALL questions (English sentences

to translate) were generated randomly and students could do each exercise in a single sitting or in multiple sittings over the course of several weeks. Thus it was not the case that improvements were down to question-ordering or the effects of short-term memory. Furthermore sentence-types could be fairly complex, and students had to attempt to get all aspects of a sentence correct, so it was not simply a matter of concentrating on a single grammatical aspect such as verb endings. Students often chose to do far more than the minimum number of questions per exercise than they were obliged to do, because they found the system helpful and were aware that they were improving by using it.

Example scenarios

A scenario is a description of a speculative event, describing a problem/issue/desired function in a well-defined context, and a possible manner of addressing it. It is similar to a case study, except that it deals with an anticipated or speculative future event, rather than looks back on an actual one. During the project both tutors and software developers were asked to create possible scenarios making use of the identified patterns, and we describe here one example developed by each group. These scenarios were generated as the main activity of one of the Practical Enquiry Days in which the patterns generated within the project were presented and participants asked to identify a problem context from their own experience and then try to use one or more of the patterns in order to address the problem.

Tutor-originated scenario

Situation

The setting for this scenario is any teaching situation in which some of the students are able to succeed completely at the task set.

Task

In these teaching situations the students who do very well on the tasks typically receive very little in the way of formative assessment or feedback, beyond perhaps a 'Well done', whilst their colleagues who do less well receive significant feedback.

This problem can potentially arise from the use of **TRY ONCE, REFINE ONCE** pattern (that is it could be seen as a potential 'liability' in the pattern) where the correct answer leads to a mark of 100% and no feedback, whereas an incorrect answer leads to feedback.

The tutors wished to provide feedback for those who succeed.

Patterns

There are two aspects to the proposed solution, and the tutors identified one pattern for each aspect:

- Providing feedback to those who achieve well – using the pattern **SHOWCASE LEARNING**.
- Helping tutors to adopt such feedback practices – using the pattern **FEEDBACK ON FEEDBACK**.

Solution

The pattern **SHOWCASE LEARNING** could be used to celebrate students' work; this will enable examples of good work to be seen and to receive feedback from peers and tutors.

The training of tutors to provide appropriate feedback in this context can be provided by using the pattern **FEEDBACK ON FEEDBACK** in which tutors receive feedback on the feedback that they give to students, thus helping them to identify appropriate types of feedback in this particular context.

Developer-originated scenario

Situation

First year undergraduate students starting a new subject in large classes (around 600) supported by small tutorial groups (6-12 students), taught on campus and with access to a VLE.

Task

A number of such courses require that students learn large new vocabularies quite quickly. Two contrasting examples would be biology where students are expected to master a large number of unfamiliar terms, and philosophy where students are expected to master the specific technical meanings of words and phrases which are well-known in their everyday meanings. Formative assessment has potentially an important role in the learning of these vocabularies.

Patterns

The developers identified four patterns which could inform a solution:

- **NARRATIVE SPACES** – giving students opportunities to express themselves in narrative form;
- **OBJECTS TO TALK WITH** – online representation of constructed artifacts;
- **CLASSROOM DISPLAY** – students sharing work with a trusted audience;
- **SHOWCASE LEARNING** - publically celebrating student's work.

Solution

Students would build up their own personal glossaries, individually typing in the words and their own definitions, illustrating use in context, and then come together to share these definitions. This is an application of **NARRATIVE SPACES** giving learners opportunities to express themselves in narrative form, supporting the use of the vocabularies in context, and then bringing them together into groups where again

the discussion and comparison of the definitions practices the use of the language of the domain. In the case of biology the incorporation of images would also be important.

Using **OBJECTS TO TALK WITH** the vocabularies and definitions are made into objects to talk with through being externalized, resulting in the sharing of individual definitions in groups, with peer assessment, commentary on other definitions and voting for the best definitions.

A **CLASSROOM DISPLAY** can be used as these meanings become more stabilized, enabling the sharing of personal understandings of vocabularies with a trusted audience.

The **SHOWCASE LEARNING** pattern becomes applicable as these definitions are refined, moving up from small groups to tutorial groups and finally to the whole class with a process of voting and selecting the best at each stage, enabling the public celebration of the students' work.

There are some potential pitfalls in this approach:

- No one definition may incorporate all the necessary parts, and a synthesized ideal version may be required;
- There is a danger that vocabulary definitions may be undermined by voting systems and perhaps the most amusing definitions rather than the best definitions become the ones remembered.

However, what finally ends up in the public space can be filtered by the tutor, and the tutor can also facilitate some kind of synthesis if this is needed, and it is likely that the putting up of definitions into a public space, in the form of a show case, would encourage the process to be taken very seriously by the students.

Technologically this would be delivered as a forum or a wiki in Moodle.

Augmented domain map

In Figure 3 we have mapped our cases and patterns onto the domain map taken from Black and Wiliam's description of the key aspects of formative assessment.

	Where the learner is going	Where the learner is	How to get there
	Setting the agenda		
Teacher	Clarify and share learning intentions	Engineering effective discussions, tasks and activities that elicit evidence of learning	Providing feedback that moves learners forward
		3 Hats + PED 2 + Narrative spaces (*) Academic writing WebLabs Grade it again, Sam	Soft Scaffolding WebLabs Feedback on Feedback Audio files Open mentor
Peer	Understand and share learning intentions	Activating students as learning resources for one another	
		Round and deep Academic writing Showcase learning Creature of the week Narrative spaces (+) WebLabs	Objects to talk with Classroom display CoMo Programming puzzles Streaming theatre 3 Hats + PED 2 + Use my stuff Prepared examples
Learner	Understand learning intentions	Activating students as owners of their own learning	
	Narrative spaces (*) Audio files	Try once refine once String comparison Wear your skills Flash meeting	3 Hats + PED 2 + Narrative spaces (***) WebLabs Academic writing

Included Patterns Included cases + / + Our methodology extends uses conflicts
Additional patterns Additional cases

Figure 3: Augmented Domain Map

This provides a useful mapping of the patterns we have described, and will enable us to further develop and refine the patterns in terms of the theoretical framework adopted. Besides positioning the patterns that we have already described within this framework this mapping also points up those areas which are poorly represented. The most significant lack is for the key strategy ‘Clarifying and sharing learning intentions and criteria for success’ and it is clear that there is considerable scope for the development of patterns to address this strategy.

Conclusions

This paper presented patterns derived from the project ‘Scoping a vision for formative e-assessment (FEASST)’. The main focus was on four design patterns: **CLASSROOM DISPLAY**, **FEEDBACK ON FEEDBACK**, **SHOWCASE LEARNING** and **TRY ONCE, REFINE ONCE**. These patterns were derived directly from the case stories described in Pachler, Daly, Mor and Mellar (2009), and are supported by the theoretical framework of Black and Wiliam (2009). Six additional patterns (most of which have been published elsewhere) have been linked to these patterns and cases to form the skeleton of an emerging pattern language. These patterns were applied to two novel problem scenarios and used to develop solutions for them.

Although these patterns have direct implications for software development, they are in essence technology neutral: they highlight the pedagogical processes and outline how technology should be used to support these. The emerging pattern language illustrated the complexity of formative e-assessment, but at the same time suggests that it can often be addressed by relatively simple solutions, as long as these are carefully designed.

Apart from their concrete content, these patterns demonstrate the powerful potential of design pattern in e-learning research and practice, as linchpins between theory and craft. This role was emphasized by the methodology by which the patterns were developed, which combined case stories of successful practice with a review of the theory of the field, and used design patterns as a means for abstracting from the former and grounding the latter.

References

- Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). The nature and value of formative assessment for learning. *Improving Schools*, 6, 7-22.
- Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21, 5-31.
- Eckstein, J. Manns, M. L. Sharp, H. and Sipos, M. (2003) Teaching from different perspectives. In *Proceedings of EuroPloP'03 — Eighth European conference on pattern languages of programs*, 25-29 June, Irsee, Germany
- Finlay, J., Gray, J., Falconer, I., Hensman, J., Mor, Y., & Warburton, S. (2009). *Planet: Pattern language network for web 2.0 in learning: Final report*. Retrieved from: <http://www.jisc.ac.uk/media/documents/programmes/usersandinnovation/planet%20final%20report.pdf>
- Fowler, A. M. L. (2008). Providing effective feedback on whole-phrase input in computer-assisted language learning. In F. Khandia (Ed.), *12th International Computer Assisted Assessment Conference 2008* (pp. 137-150). Loughborough: Loughborough University.
- Fowler, A. M. L. (2006). Logging student answer data in call exercises to gauge feedback efficacy. In J. Colpaert, W. Decoo, S. v. Beuren & A. Godfroid (Eds.), *CALL & Monitoring the Learner - 12th International CALL Conference* (pp. 83-91). Antwerp: LINGUAPOLIS, Universiteit Antwerpen.
- Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*, 77, 81-112.
- Jewitt, C., & Kress, G.. (2003). *Multimodal literacy*. New York: Peter Lang.
- Kulhavy, R. W., & Stock, W. A. (1989). Feedback in written instruction: The place of response certitude. *Educational Psychology Review*, 4, 279-308.
- Laurillard, D. (2002). *Rethinking university teaching: a conversational framework for the effective use of educational technologies* (2nd. edition). London: Routledge.
- Mor, Y. (2008), Guess my X and other patterns for teaching and learning mathematics, in T. Schümmer & A. Kelly (Eds.), *Proceedings of the 13th European Conference on Pattern Languages of Programs (EuroPloP 2008)*. Retrieved from: [http://telearn.noe-kaleidoscope.org/warehouse/gmx-europlop08_\(002232v1\).pdf](http://telearn.noe-kaleidoscope.org/warehouse/gmx-europlop08_(002232v1).pdf)
- Mor, Y., & Winters, N. (2007). Design approaches in technology enhanced learning. *Interactive Learning Environments*, 15(1), 61-75.
- Nicol, D. (2007). Principles of good assessment and feedback: Theory and practice. From the REAP International Online Conference on Assessment Design for Learner Responsibility, 29th-31st May, 2007. Retrieved from: http://www.reap.ac.uk/reap07/Portals/2/CSL/keynotes/david%20nicol/Principles_of_good_assessment_and_feedback.pdf
- Nicol, D., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education*, 31, 199-218.
- Pachler, N., Daly, C., Mor, Y. and Mellar, H (2010) 'Formative e-assessment: Practitioner cases' *Computers & Education*, 54, 715-721.

Pachler, N., Mellar, H., Daly, C, Mor, Y., Wiliam, D., Laurillard, D. (2009) *Scoping a vision for formative e-assessment*. Retrieved from: <http://www.jisc.ac.uk/Home/publications/documents/feasstfinalreport.aspx>

Winters, N., & Mor, Y. (2009). Dealing with abstraction: Case study generalisation as a method for eliciting design patterns. *Computers in Human Behavior*, 25, 1079-1088.

Whitelock, D. M. (2007). Computer assisted formative assessment: supporting students to become more reflective learners. In: C.P. Constantinou, Z.C. Zacharia, and M. Papaevripidou (Eds.). *Proceedings of the 8th International Conference on Computer Based Learning in Science (CBLIS '07)*, pp. 492–504 Crete, Greece: E-Media, University of Crete.

Whitelock, D., Watt, S. N. K., Raw, Y., & Moreale, E. (2003). Analysing tutor feedback to students: first steps towards constructing an electronic monitoring system. *ALT-J*, 11, 31-42.

Patterns

Bergin, J. (2000a). **GOLD STAR**. Retrieved from: <http://csis.pace.edu/~bergin/PedPat1.3.html#goldstar>

Bergin, J. (2000b). **GRADE IT AGAIN, SAM**. Retrieved from: <http://csis.pace.edu/~bergin/PedPat1.3.html#gradeitagainsam>

Kohls, C. Pattern (2008): **USE MY STUFF**. Retrieved from: <http://patternlanguagenetwork.myxwiki.org/xwiki/bin/view/Patterns/UseMyStuff>

Schadewitz, N (2008) **WEAR YOUR SKILLS ON YOUR SHIRT**. Retrieved from: <http://patternlanguagenetwork.myxwiki.org/xwiki/bin/view/Patterns/WearYourSkills>