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A GENERIC TOOL TO SET UP METACOGNITIVE JOURNALS AND THEIR SERENDIPITOUS USE

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Abstract
Reflective journals for individual learners are a powerful pedagogical approach to foster metacognition. However, the set up of individual journals in an online learning environment can be a very time consuming task. This contribution will take the creation of reflective online journals as an example to highlight the need for generic educational tools. The creation of such a generic tool to generate reflective online journals will be discussed. Preliminary evaluation of the use of this tool has shown an unexpected and surprisingly creative use of how teachers have applied it to their online learning environments.

Keywords
Reflection, Reflective Journals, Metacognition, Generic Tool

Background

Despite a long tradition of research and development in education, there is still a huge potential for improvement. This paper starts by highlighting two major challenges we face in education, then looks at the importance of metacognition in general and focuses on reflection as a concrete example of this. The need for generic educational templates and tools is illustrated by the example of the development of an electronic assistant to set up reflective journals.

Two major challenges for education

Higher order thinking skills
Society and the environment are complex systems imposing intricate questions and problems that require sophisticated skills to solve. Theoretical knowledge of facts and their basic application does not help to overcome critical situations because such situations cannot be found in textbooks or practiced in tutorials due to their complexity and multi-disciplinary aspect. Higher order thinking, like analytical and critical thinking, evaluation and judgement skills, are crucial to cope with such complex, multi-layered problems. It is therefore not surprising if education focuses on the appropriation of higher order thinking skills.

Transferability of skills and competencies
Transfer of learning is another emerging problem whose significance has been acknowledged by the educational scientific community, National Educational Authorities and the economy (Bennett, Dunne, & Carre, 1999; Candy, Crebert, & O'Leary, 1994). It proves to be very difficult to apply skills and knowledge acquired in educational settings to new situations encountered in the workplace (Gruber, Law, Mandl, & Renkl, 1996). However, it is absolutely crucial that skills and competencies can be transferred from schools and universities and applied to industry.

Constructivist approaches as a possible solution

Traditional pedagogical methods based in the behaviourist theory of learning are ideal for the efficient acquisition of basic knowledge, i.e. in terms of Bloom's taxonomy (Bloom, 1956) knowledge, comprehension and application. However, since these behaviourist methods do not account for individual thought processes, they are limited to recall and are not suitable to foster the development of higher order thinking skills like analysis, synthesis and evaluation (McMahon, 1997). Because of these limitations of behaviourist teaching, approaches based on the constructivist theory of learning with its emphasis on internal processes of thinking, individual construction of knowledge and situated cognition seem to be more appropriate to foster higher order thinking (McMahon, 1997). A wide variety of teaching approaches claim to be constructivist, but all that glistens is not gold. However, the following constructivist frameworks have proven to be successful in fostering higher order thinking and transferability of skills:

Cognitive Apprenticeship adopts the traditional apprenticeship model which used to be very popular in crafts, trade and industry and transfers it to the cognitive domain. Cognitive Apprenticeship aims at externalising processes that are usually carried out internally (Collins, Brown, & Newmann, 1989, p.457). The cognitive apprenticeship approach works with methods like modelling, coaching, scaffolding, articulation, reflection and exploration (Collins et al., 1989, p.476).

Collaborative knowledge building communities is an approach led by scientific research communities (Scardamalia & Bereiter, 1992, p.42). It is based on the design principles of objectification (knowledge is treated as an object), progress (knowledge-building activities should lead somewhere and progress should be perceptible), synthesis (construction of higher order representations and integration of knowledge), consequence (something nice should happen to students as a result of knowledge processing operations), contribution (individuals perceive their contribution as part of the advancement of the group's knowledge), cross-fertilisation (contact with related ideas unrestricted by any boundaries) and sociality (integration into the social life of the classroom) (Scardamalia & Bereiter, 1992, p.44-46).

Goal-based scenarios focus on students as active participants in complex systems (Schank, Fano, Bell, & Jona, 1993/1994). Learners are immersed in real-world situations driven by a meaningful, accepted goal and engage in authentic activities.

Constructivist learning environments is a generic design model for authentic, complex learning environments. It consists of problem description and their multi-modal representation as the focus of learning, and the following interdependent components which assist learners to understand and manipulate the problem: a collection of authentic information resources, related cases, cognitive tools to support knowledge construction and collaborative tools to foster cooperation (Jonassen & Rohrer-Murphy, 1999).

The role of metacognition

The term 'metacognition' is not defined consistently in the literature. For example, there is no clarity if metacognition is a different construct than self-regulation or if self-regulation is part of metacognition or vice versa. However, all definitions include at least the following elements (Pintrich, 1993; Wilson, 1999):

- Awareness or monitoring of thinking and learning processes.
- Strategies to consciously reflect on and regulate thinking and learning processes.

When we have a closer look at the constructivist frameworks for teaching outlined above, most of them contain an element or tool to raise awareness about the thinking and learning process itself. Even though there are inconsistencies about the exact definitions of the construct 'metacognition', there is general agreement on its significance for effective learning (Luca & Oliver, 2003; McCombs, 1988; Pintrich, 1993) and the promotion of higher order thinking skills (Candy et al., 1994). Luca and Oliver have identified reflection and self-regulated learning (together with authenticity) as key elements which are consistently stated in the literature as important for successful learning to take place (Luca & Oliver, 2003).

Reflective journals as one approach to foster metacognition

Two issues need to be mentioned when talking about teaching metacognition: First, there is a considerable debate as to what degree metacognition can be taught directly or whether such cognitive control

strategies have to be acquired indirectly (McMahon & Oliver, 2003). Secondly, it is not clear to what degree metacognition is domain specific or not (Schraw, Dunkel, Bendixen, & Debacker Roedel, 1995). Until these questions are answered (if they can be), it is best to take an approach that contains both domain specific and general elements and includes direct instruction and the indirect appropriation of metacognitive skills over a longer period of time.

That is exactly the approach that a reflective learning journal takes. How does a reflective learning journal work? Normally, a teacher introduces a reflective journal by giving some background information about metacognition, i.e. giving general, direct instruction. Then students are asked to fill in their personal journal on a regular basis for a given subject. They can be asked an open question e.g. 'How would you describe your learning progress in this subject?'. Or they can be asked more specific questions e.g. 'What helped you most to achieve this weeks learning goals?'. The learning journal is indirect and domain specific over time. Therefore, a reflective journal is a way to engage learners with their knowledge construction process fostering an indirect and direct as well as general and domain specific approach.

Implementing reflective journals into an online learning environment

In the previous part, the educational value of metacognitive journals for reflection has been discussed. In the following part we will have a closer look at the implementation of reflective journals into an online learning environment. However, let us first have a broader look at generic educational electronic tools and templates currently available for online teaching.

The need for generic educational electronic tools and templates
Teachers are faced repeatedly with similar problems, in different educational contexts, where they have to develop similar solutions. There are a range of effective pedagogical methods and techniques that foster high quality learning activities, but which are difficult or time consuming to implement in an online learning environment. It would be very helpful to have generic templates to assist teachers with the implementation of best practice approaches into their courses. Generic educational tools would save teachers time to focus on pedagogy instead of worrying about the technical set up (Moodie & Kunz, 2003). Looking at existing Learning Management Systems (LMS), it is apparent they don't offer generic, customisable templates to organise educationally sound learning activities. There are attempts in this direction, e.g. ARIADNE (http://www.ariadne-eu.org/en/system/ index.html) offers a set of tools. However, these tools aim more at the creation of new learning objects than at being empty shells in which to place existing learning objects. The call for a set of templates to facilitate the process of setting up meaningful online learning environments is not new. Lyardet and his colleagues, coming from a software engineering background, suggested the use of 'design patterns' to develop educational multimedia (Lyardet, Rossi, & Schwabe, 1998). Others with a more educational point of view like Diana Laurillard or the Australian University Teaching Committee (AUTC) have also identified the need for generic, customisable shells to support learning activities based on an agreed set of characteristic forms of effective e-learning (Harper, Oliver, & Agostinho, 2001; Laurillard, 2002).

Key issues in the development of generic electronic tools and templates
The following three key issues need to be kept in mind when developing generic educational tools to assist teachers in setting up their online courses (Moodie & Kunz, 2003):

Easy to use:
Teachers' knowledge of computers and the Internet is heterogeneous. Some of them have reached high levels of expertise whereas others have hardly ever touched a computer, however, most of them are used to photocopying diagrams, cutting and pasting them it into their work sheets, etc. from the analogue world. Using an online LMS to teach should be as easy as that. Electronic assistants that divide technically complicated processes into easy to handle steps are crucial.

Customisable:
The challenge is to convert effective pedagogical methods into templates that allow teachers a certain degree of flexibility. Teachers want be able to use these templates in many educational situations and to tailor them according to their personal preferences. These educational tools need to be "re-purposable", i.e. they should be easy to adapt and customise for any purpose.

Keeping the balance: not too generic, not too specific
If an educational template is too generic, users spend too much time adapting them for their corresponding need. If it is too specific, the tool serves only a limited number of applications and is not adaptable for broader use. Therefore, templates for setting up learning activities have to be designed to be generic without losing their core educational effectiveness.

Tools currently available to set up reflective online journals

This section reviews software tools currently available to set up electronic reflective journals. Let us first have a look at the situation in a face-to-face environment. Individual journals are relatively easy to implement in a face-to-face setting, once the teacher has decided on the framework for the journal entries. However, apart from excluding distance learning students, the administrative problems associated with students entering comments, making sure that this is done in a timely fashion, viewing the students' writing and keeping up with the task, is an onerous one for teachers in a traditional classroom setting.

These problems can be overcome by using an online learning environment, where also distance students can participate, and teachers have access to the journals independent of time and location. In the following a selection of applications which are capable to assist to implement reflective journals online:

ePortfolios
Electronic portfolios or *ePortfolios* is an adaptation of the traditional portfolio concept which has been used in the Arts for decades. An ePortfolio is basically a collection of documents and its range of application is very broad. It can be applied for assessment as well as for personal resumes, curriculum vitae, alumni career track and, of course, for reflective journals. There is now a number of tools available to build ePortfolios (see Batson 2002 for an overview), most of them stand-alone solutions which are not integrated into a comprehensive LMS.

Weblogs / blog
The second very promising candidate, to build reflective online journals, are *weblogs* or short *blogs*. A blog is *"a web page made up of usually short, frequently updated posts that are arranged chronologically"* (http://www.blogger.com/about.pyra) and can be considered as "instant messengers of the web" because of their immediateness. Weblog tools are based on database and templates and allow users to quickly and easily create, maintain, and update websites with a minimal amount of coding knowledge (Ashley, 2001). Users can chose of a wide range of blogging tools (see http://www.lights.com/weblogs/tools.html for an overview). Blogs are very versatile in their application, their purpose ranges from personal diaries, poetry, newsletter, knowledge management and community building. The potential for weblogs for education is considered as almost limitless (Roberts, 2003). If such a panacea exists, it is not part of this discussion, however, blogs have definitively great potential to be used as a way to implement reflective online journals.

Both ePortfolios and blogs are very promising tools to work with electronic reflective journals, however, they raise the following issues: On the one hand, there are students' concerns about privacy (Stiler & Philleo, 2003). On the other hand, there are technical issues preventing blogs and ePortfolios from being perfect for their use as reflective journals. Although both applications are easy to set up, blogs and ePortfolios are separate from a potentially used course website where all other learning resources of a course are tied together. Students as well as teachers need to visit different websites, creating a usability obstacle. Furthermore, a teacher has to visit all different blogs / ePortfolios in order to keep track of what is happening in the individual journals. There is no notification system that alerts teacher of new postings.

And what about existing LMSs?
In an LMS, the establishment of individual journals requires the teacher to set up areas for each individual student where only the student and the teacher(s) have access. Of course, this can be handled in almost any commercially available LMS if users have enough time and the necessary technical skills. However, a smart LMS would offer an electronic assistant or tool to accelerate the set-up of individually accessible online journals. As a response to the development of blogs and ePortfolios, several commercially available LMS have now started to integrate either ePortfolio and/or blogs into their systems solving the problem of separation of the journals from the rest of the online learning environment. Therefore, it is interesting to observe the results of these endeavours.

Building the tool

Background information
Because of the lack of generic educational templates, our team has started to develop a set of what we call "wizards", which guide teachers through a step-by-step process to incorporate content into a learning activity. These tools are built into the LMS named PLACE™. The first of these wizards, which has been finalised, tested and is now in use, was an assistant for setting up reflective journals. The three principles stated above (ease of use, customisability and balance between generalisation and specificity) have been guiding the development process. Following are steps and insights gained from the making the first educational tool. Building the tool was the subject of an action research project (Moodie, 2002b). It was built in two phases:

Phase one:
An initial prototype system had been developed for a teacher who wanted an area in the online learning environment where students could post their personal reflections about their learning process, and another one where they could have private one-to-one discussions with the teachers. This first prototype consisted basically of a template which helped set up a discussion for each student in the class shared only between the individual student and their teachers.

Phase two:
The second developmental phase of the tool was aimed at improving the tool by integrating the feedback gathered from the initial prototype. It was recognised that developing a template specifically tailored to one style of teaching would make it harder to use for other potential users. Therefore, the major aim of this second phase of development consisted in making the tool more generic without loosing the ease of use of the tool.

A key question at this stage was to determine the extent to which teachers should be involved in the development. Would using a team of teachers lead to an outcome suited to meet the needs of the majority of potential users? Involving a user (teacher) consulting group would be time-consuming and present the following problems (Moodie, 2002a): The group would be self-selecting and therefore not a representative example of teachers. This could lead to a tool with too narrow a focus. Therefore, the development team decided to include a wide group of teachers later in the process after a first revised version of the prototype was available and employed other ways to apply the end users' perspective during the first stages of the re-development of the prototype (Moodie, 2002a). The fact that five of the six people involved in the development team had some teaching experience led to the use of 'role-play' and 'thinking aloud'. For the first technique, role-play, the learning designer who was a member of the development team, played the role of a teacher and potential user and maintained a focus on the pedagogical aspects and usability of the tool. This reflective teacher role is important to the development meetings. The second technique, 'thinking aloud', proved to be a valuable way to prompt   individuals to think outside of their traditional roles. This technique led to gaps in the tool being addressed before implementation. The combination of 'role play' and 'thinking aloud' led to a good representation of the general characteristics of the user community.

The resulting tool: The 'workbooks wizard'

The resulting tool is an electronic assistant called 'workbooks wizard' with a 'workbook' being not only a reflective journal, but any area where individuals or groups can work online. The workbooks wizard guides users through a four step set-up process, asking for all required information, taking a couple of minutes to step through. The assistant is easily accessible for teachers from within the LMS. During the step-by-step process, users can customise the workbooks by entering the following context-dependent information:

- A description of the task which will appear at the top of every single workbook:

  These are the instructions for the learners of what they are supposed to do in this area. The teacher defines the purpose of the workbook based on the context. This is crucial to the customisability and generalizability of the tool.

  In terms of ease of use, teachers have flexibility in how they enter the description: They can type directly into the corresponding field, use html (e.g. copy and paste the code from a page created within an html editor) or copy and paste from an existing text-editor. In the future, they will be able to upload existing descriptions from a linked learning objects library.

  The feedback from the initial prototype revealed that teachers used this template not only for reflective journals, but also for setting up assignment upload areas. Therefore, it was decided to include a confirmation message regarding the issue of plagiarism (see figure 1) which can be changed, included as is or excluded, depending on the purpose of the workbook.

Figure 1: Workbook description and optional confirmation message in case the workbook is used for assignment upload.

- Setting teachers' access

  In case there is more than one teacher/tutor in the class, the setup assistant allows access rights to be changed with a few clicks of the mouse. The goal of this step is to keep the tool as generic as possible.

- Selecting students access (see figure 2):

  Teachers can select from three different options, depending on the purpose of the workbook, e.g. for a teacher to student one-to-one discussion, an assignment upload area or a personal feedback area, the access should be kept private to the individual learner. For reflective journals it can be valuable to give other learners read-only access so that they can share their learning progress.

  Again, this option was implemented in order to keep the tool generic without adding too much to its complexity or diminish its ease of use.

ClassForum : Electronic Workbooks Wizard

Set Student Access

Private to Student ⦿

Other students in group (participant) ○

Other students in group (readOnly) ○

Cancel   Back   Finish

For each discussion in a student's Workbook you can determine which students have access.

- Private to Student: Student have participant access to their own discussion.
- Other students in group (participant): Students have participant access to all student discussions.
- Other students in group (readOnly): Students have access to read all students discussions

Figure 2: Setting up students' access privileges to the workbooks

After clicking on the finish button (see figure 2), the workbooks wizard takes a few seconds to a few minutes, depending on the class size, to set up all individual areas with the corresponding descriptions and access privileges. Of course, descriptions as well as access rights can still be changed after going through the wizard, however, if there are many changes required it is recommended to simply using the wizard again.

Serendipitous use

Antecdotal feedback from users has been consistently positive (Moodie, 2002a). However, we wanted to have a more reliable picture of how well the three principles that guided the development process (ease of use, customisability and balance between generalisation and specificity) had been put into action. Therefore, a basic email-survey was sent out to 34 online teachers from different departments of the university who used the tool and asked them about the ease of use, for comments about if and how the tool has affected their teaching and what they use the tool for. Following is a summary of the answers received from nine respondents who teach a broad range of subjects:

Ease of use of the tool
In general the replies to this question can be summarised with the following quote: *"I have not had any difficulty with it at all, seemed quite intuitive to me."* However, there were a few suggestions on how to improve the tool that we will take into account for the next update cycle. People for example reported a certain dislike with the term 'wizard' (which has been chosen to differentiate the tool from other notorious software assistants) and others had problems seeing the big picture of what they were going to produce with this tool.

Comments about if and how the tool has affected their teaching
The tool does not make teaching itself easier, but it was stated that it was a huge relief and an enormous time-saver in terms of administration and organization. It allows teachers to focus on teaching instead of being bothered with technical issues: *"I do not think that having wizard has made my teaching easier, but it certainly has helped make administration and management of the class far less complicated. As I do not have to spend as much time setting up any paper, I can be more effective in my planning by using the*

time gains to benefit the actual content material in my classes which is where I feel my energies should go anyway if we are to have an effective learning space." And other interesting observation which was reported by one of the lecturers was the fact, that individual workbooks used as one-to-one discussions between teacher and student helped to deal with many personal issues which otherwise would have been discussed in public and which would have distracted the entire class: *"But one thing is for sure it gets all the noise, confusion and uncertainty out of the way of the learning process."*

What they use the tool for
Initially, the workbooks wizard was developed for the set-up of metacognitive journals: *"Have also set up a discussion as a reflective journal to record progress and thoughts during the paper. One "What did I learn this week?" was a most successful example of this."* However, it was intriguing to observe lecturers using this wizard for quite a range of other purposes than this original one.

- Assignment-upload:
  "It organises and keeps a record of assignment drop-off much better than email. ... For the course that I teach (translation theories), we mark using track changes and put the marked version straight back in the workbook (no paper)."
- Portfolios:
  "I use ePortfolios in my classes. These consist of a discussion for each of the four Modules of work. I have also added a discussion place for interaction with the student and myself and any other teacher in the class."
- Individualised feedback:
  "We use these as individualised workfolders for students to place ideas/assessment preparation in for formative feedback from online mentors. For many participants this is a source of discussion and clarification individually which is different from the more public forum discussions."
- Project work
- One-to-one discussions:
  "Readily accessible way of having a personal communication site available for individual students for a range of purposes.";
  "... we just use it to create a help space for all of our 150-250 students"
- Combined purposes:
  "Create portfolios (which are places for one-to-one communication, especially about assessment feedback) and for groups";
  "We generally have two discussions in our workbooks; one to place work in and the other for one-to-one discussions with the student."

These statements prove that the workbooks wizard has managed to be generic enough to allow teachers to use it for a broad range of different educational applications. However, this fact also raises the expectations of the teaching staff as the following quote illustrates: *"The Wizard is great (just wished it cooked the evening meal as well!!)".*

Conclusions and perspectives for the future

The experiences creating the electronic workbooks wizard, the feedback from lecturers and their serendipitous use of this tool demonstrates the need for generic educational tools:

- The resulting wizard fulfils the guiding developmental principles: It is easy and intuitive to use; it was customisable to a broad range of subjects and purposes; teachers used it for the creation of reflective journals (its original purpose), but they also use it for other educational goals. The tool is therefore not too specific and not too generic.
- The three guiding developmental principles (ease of use, customisability and balance between generalisation and specificity) have proved to be very helpful in the development of a useful generic educational electronic tool.
- Making teaching and learning awareness an integral part of the development process was key to the success of the tool.

- Therefore, it is crucial to have people with an educational background and teaching experience in the development team.
- Despite the late integration of teachers as potential users, the two moderation techniques, 'role play' and 'thinking aloud', applied during the development process supported a user-centred focus.

All in all, the development and use of the electronic workbooks wizard, as a generic educational tool, demonstrates the demand for electronic teaching assistants. Based on subsequent demand, a peer assessment tool has been developed and is in the final phase of testing. Next on the list is a 'role play' wizard that will allow teachers to set-up 'role play' discussions with clear role descriptions and role allocation. After that a case study template will follow. These tools were developed to meet the demand of teaching faculty as well as pedagogical best practice. The tools will foster the dissemination of good teaching practice in institutions using a LMS with integrated generic educational tools.

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