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The Design of Reflective Journals as Course Evaluation Instruments - an Information Systems Case Study

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ABSTRACT
This paper examines the use of a reflective journal system in an Information Systems course, focusing on the effectiveness of the journal for course evaluation. It explores the criteria used for designing the system, the reasons for designing the system, and presents some initial evaluations as to the effectiveness of the journal. Finally, it concludes by suggesting that the journal was effective, but further work would need to be completed in order for the reflective journal model to be useful in large classes in terms of course evaluation, and suggests some directions for further research.

Keywords
education, reflection, journals, learning logs, reflective journals

INTRODUCTION
The value of reflective journals has been well established in the IS literature. However, most of the focus on the use of reflective journals has been on their value to the author, irrespective of whether the author may be a professional IS developer, an academic (for example, Bretag, Horrocks & Smith, 2002 and Hodson and Joham, 2003, who employed reflective journals to improve their own practice; and Janesick, 1999, where a case is developed for the use of journals in qualitative research), or a student (George, 2001; Fekete et al, 2000; Beveridge, 1997). Arguably this is partially due to how reflective journals are traditionally seen as inherently personal in nature. Reflection, after all, is something for the actor to experience, as the aim is to see your own reasoning reflected back at you, and reflection is the primary aim of a reflective journal. It should also be noted that some researchers, such as (Hogan, 1996 and Lynch and Metcalfe, 2003), suggest that writing journals with audiences other than the author in mind risks limiting the ability (or willingness) of the author to be honest in their accounts, and thus damages the process of reflection. Nevertheless, a number of researchers have noted that reflective journals/learning logs are often valuable to individuals other than the authors themselves. These include Barclay (1996), who assigned reflective journals to student/practitioners and then evaluated but the author's responses to the journals as well as the responses of management to the journals; and Baker (2003) who in a "teaching tip" discusses the value of shared journals. In particular Baker, while acknowledging the value of a learning log to the student, suggests that an individual student's learning log can also be of value to both faculty and other students. Drawing upon his experiences in teaching an information systems security course, he suggests that a student's learning log can be shared with other students as the basis for discussion and for further analysis of topics. But perhaps even more interesting is Baker's suggestion that regularly submitted logs can be employed by faculty to gauge the progress of a student in an assignment, and thus can highlight students who may be in need of personal attention (Baker, 2003, p12).

Journals as Course Evaluation Instruments
An extension of Baker’s argument is to employ the learning log or reflective journal to highlight difficulties - and potentially strengths - that students may be encountering with various aspects of a course. For example, journals may be employed to highlight problems the students are having with the material covered in the lectures; or difficulties they are having with the assessment procedures; or even issues they may have with the 'technical' aspects of the course, such as tutorial times or computer lab access. On the positive side, student journals may also be used to gauge the reaction to new teaching techniques or tools. In short, it may be possible - and even valuable - to use student journals as Course Evaluation Instruments (CEIs).

But even if this role is recognized, the nature of reflective journals makes them difficult to formally employ as CEIs. The primary problems include:

- The overall volume of information contained in reflective journals, especially when applied to large classes, precludes easy analysis.
• The lack of focus in a typical journal in terms of specific course-related issues.
• The difficulty in ensuring that students write journal entries.
• Problems faced in ensuring that students feel that they can honestly express their concerns, even when they are aware that their comments may not be presented anonymously.

Some of these problems are consistent with those found in both student journal writing and course evaluation in general. Nevertheless, surmounting these sorts of problems may prove to be essential when applying journals to course evaluation.

BACKGROUND
Reflective journals have been employed in various Information Systems courses at the author’s university over a number of years, at both undergraduate and postgraduate levels. They have also been employed in other programs at the university (for example George, 2001), and are commonly recommended as a research aid for doctoral candidates. They have also been used by Information Systems faculty to improve their own teaching, most notably in areas such as database design and systems analysis (Bretag, Horrocks and Smith, 2002). However, this particular research project was primarily informed by the use of reflective journals in two separate courses.

Business Systems Design and Implementation
The first of these, Business Systems Design and Implementation (BSDI), was a project-based course employing a considerable amount of group work. The course was intensive, both due to the nature of the group project and the difficulty of the course's content. The reflective journal was assigned to the students in order to encourage them to "document lessons learnt so [the students] can make them explicit which helps [the students] apply them to new situations" (Horrocks 2002, page 12). Thus the primary aim was to assist the students in their learning. However, it was felt by the course coordinator that the journals were not very successful as learning aids. There were a number of possible explanations as to why this might have been the case, including the concern that the undergraduate students may have lacked sufficient experience to be in a position to fully reflect on their actions. But be that as it may, one very clear problem that emerged was that a percentage of the students chose not to complete their journals each week, choosing instead to wait until the day before their journals were due and to try to write the required number of journal entries from memory.

In spite of this, the reflective journals proved to be useful in ways that were not part of the specified aims. By documenting the experiences of the students the journals were able to reveal to the course coordinator some of the difficulties they faced why studying in the course. In particular issues concerning the availability of resources were highlighted. Other problems were also revealed, including, but not limited to, issues concerning assessment and student workload. Indeed, it can even be reasonably said that the journals were an influence, albeit not the primary one, in the complete redesign of the course in 2003.

Individual-Based Projects
The second course which directly informed the design and implementation of the reflective journal system was a course built around industry-based projects, and was offered in semester 2, 2002. This course had been using reflective journals for three years, and had been experimenting with the design of the journals throughout that time (Lynch and Metcalfe, 2003). In 2002 this journal took the form of a regularly uploaded web page - each student was assigned space on a web server, and they were required to upload their journal entry each week. Furthermore, once again unlike the situation with BSDI, all students enrolled in the course could read the journal of any other student. This aspect is perhaps more in keeping with the weblog, or ‘blog’, approach (as described by Wagner, 2003) than the traditional reflective journal.

This format resulted in a very different set of advantages and disadvantages than those encountered with BSDI. On the plus side, the students completed their journals on a regular basis and students were effectively prevented from waiting until the end of the semester to write their journals. However, although analysis of interviews conducted with the students after the completion of the course is still underway, initial findings show that students had a tendency to make false claims in their journals. This they blamed on two factors - a) potential embarrassment should other students or future employers read about some of the things that went wrong, and b) the opportunity to inflate their achievements before fellow students and potential employers (Lynch and Metcalfe, 2002, page 2707).

DESIGN AND IMPLEMENTATION
In 2003, the school decided to offer a course in web-based systems development. This course was offered as an elective, and catered to a small group of fourteen undergraduate students in their second and third years of study. The majority of these
students were studying in an Information Systems degree, but a small number (two) came from Computer Science. Two main factors influenced the decision to require the students to complete a reflective journal. The first of these was along the same lines as the previous courses that were discussed here - the students were expected to complete a major project while working in small groups, and it was hoped that the journals would assist the students in recognizing and overcoming some of the problems which they would face. The second major factor was quite different. Building on the experiences with BSDI, it was hoped that the use of the journals would assist in the evaluation of the new course during and after the teaching period. These intentions led to a set of general design requirements.

1. Entries had to be submitted on a weekly basis.
2. Entries had to be accessible at all times to the course coordinator and the students.
3. Students had to feel comfortable enough to be honest about their thoughts.
4. Mechanisms had to be in place to highlight potentially significant entries.

**Web vs. Paper-Based Journals**

BSDI had used paper-based journals. The Individual Projects course had employed a web-based model. The decision as to which direction to take for the new course was a difficult one. Paper-based journals have, as their key advantage, the ability for students to record their thoughts at any time, which is very much in keeping with the reflective journal concept. Furthermore, paper-based journals, especially when contained in book form, encourage passive reflection, as students need to flick through their old entries in order to write the new one. On the other hand, web-based journals can only be completed when the user has access to both a computer and the internet, and reading old posts typically requires the user to actively select the entry from a list, thus discouraging browsing. However, web-based journals can be easier to share with other students, which was a significant factor in the Individual Projects course.

In the end, the deciding factors in this instance proved to be more administrative in nature. If the journal was to work as a CEI, it was desirable for the course coordinator to be able to read the journal entries each week, as it may be the case that some of the issues raised in the journals could be of immediate assistance in the teaching of the course. Using the BSDI experience as a guide, waiting until the end of the semester can be useful, but mostly assists the students who will be taking

<table>
<thead>
<tr>
<th>Paper-Based Journal</th>
<th>Web-Based Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write anytime, anywhere</td>
<td>Only write when online</td>
</tr>
<tr>
<td>Encourage passive reflective</td>
<td>Require active reflection</td>
</tr>
<tr>
<td>Difficult to share with multiple people</td>
<td>Easy to share</td>
</tr>
<tr>
<td>Complex submission procedures</td>
<td>Automatic submission</td>
</tr>
<tr>
<td>Difficult to administer</td>
<td>Administration tools can be built into the system</td>
</tr>
<tr>
<td>Entries stand on their own</td>
<td>Flagging tools can be developed</td>
</tr>
</tbody>
</table>

**Table 1: Some differences between paper-based and web-based journal systems.**

**Regular Entries**

Ideally, it was seen as advantageous if the coordinator could read the journal entries each week, as it may be the case that some of the issues raised in the journals could be of immediate assistance in the teaching of the course. Using the BSDI experience as a guide, waiting until the end of the semester can be useful, but mostly assists the students who will be taking
the course the next time it is offered. Similarly, for the reflective journals to be the most effective for the authors, it is arguably better if the authors make regular entries in their journals (Progoff, 1975 & 1992).

To encourage weekly submissions the system was designed to automatically date-stamp each journal entry as the author placed it online (see Figure 1). Therefore students knew that the appropriate staff member could check the frequency of their submissions at the end of the semester. Furthermore, (as discussed previously), by moving to a web-based system submissions were automatically made available to the course coordinator as soon as they were entered, allowing for very rapid feedback from and to the students. Students were also presented with positive feedback during lectures, being regularly informed of how the journals were being read, and how all of their comments were appreciated. As, indeed, they were.

**Easy Access to Entries for Staff and Students**

It goes without saying that if students and staff were not able to readily access the journal entries then they would find it difficult to reflect on and/or learn from the contents. Thus ease of access to the journal entries was a key consideration. To assist in this, students could access all of their entries for the entire period of the journal at any time (Figure 1), and a list was provided to students as soon as they logged in. Similarly, reports were provided to the coordinator listing all of the entries that had been posted, who posted them, when they were posted, and how the students rated their mood and progress (to be discussed later in this paper). These reports could also be sorted based on any of the fields, and reports could be created listing the journal entries of any given student.

**Privacy and Comfort**

It can be safely assumed that any course evaluation instrument relies on having honest comments. However, as demonstrated by Lynch and Metcalfe (2002), there is a clear risk that students may modify their entries to suit the audience. Given that the journals were being assessed it wasn’t possible to make the entries anonymous. Therefore the students were aware that the audience would include the course coordinator, and that the course coordinator would be able to identify the authors. To counter this, it was made clear to the students that they were not going to be marked on content per se, but on the frequency of the posts and the extent to which they described their experiences. Furthermore, the students were told when negative comments in the journals resulted in changes to the course, in order to demonstrate that the posting of negative comments was not a problem, and, indeed, could possibly assist them in their studies. Nevertheless, it was accepted that there might be reluctance on the part of some students to express some of their concerns. For this reason it is believed that while a reflective journal may prove to be a useful course evaluation tool, it should not be seen as sufficient in and of itself.

The other risk is that students may fear that their comments may be read by other students. To counter this the system was designed with a high degree of security. Users could submit entries, but they could only read the entries they had written. Only those with root access could read any entry, and root access could only hold for a single implementation of the journal.

**Identification of Significant Entries**

Although the current class was quite small, the number of posts was potentially quite high, and thus there was a risk that some entries might be lost through information overload. The system may also be used for other instances of this course - or indeed for other courses - when student numbers might be considerably higher. Therefore it was considered desirable that mechanisms be put in place that would allow significant entries to be highlighted.

A number of possible solutions were considered. These included:

- Functions to automatically recognize key words in journal entries, and to then flag the posts.
• An e-mail style 'priority' rating set by the author.
• The inclusion of a 'topic' field.

In the end it was decided to try two flagging tools. The first of these was a mood indicator. Students were asked to describe their mood, on the assumption that students who described their moods in negative terms would be more likely to be having problems with the course than those who described themselves in positive terms. The second indicator was a progress rating, where students were asked to rate how they viewed their own progress in learning the course materials between 1 and 10, with 1 being “very little progress” and 10 being “excellent progress.” These are visible in Figure 2. A student's progress was then automatically graphed by the system (Figure 3), thus allowing drops in progress to be recognized.

![Figure 2: Sample entry (test data) showing mood and progress fields, as displayed by the system.](image)

![Figure 3: Graph of student's progress (test data). The blue line represents the student's average progress. Posts 4-6 and 8 would warrant further investigation.](image)

**EVALUATION**

The small number of subjects involved in this case study makes most forms of statistical analysis questionable at best. Nevertheless, it does offer an opportunity to conduct an in-depth content analysis of the journals themselves. A number of questions presented themselves as a basis for the evaluation of the use of the reflective journal as a CEI. The three to be focused on here are:

• Were the journal entries submitted regularly?
• Did the journals assist in course evaluation?
• Did the highlighting mechanisms work?

A key limitation in this analysis was the strong emphasis on student privacy – it would be inappropriate to discuss the content of the journal entries directly, as the students were expecting that their entries would not be directly quoted, even anonymously. This was a response to Lynch and Metcalfe’s (2003) findings that writing for a more general audience adversely affects the nature of the journal entries, and thus the privacy of their comments was guaranteed. As a result it is not possible to provide qualitative data samples. Instead a different approach has been employed as the primary methodology for examining the data. Each journal entry has been broken up into a series of separate claims, and each claim has then been categorized according to a set of carefully designated criteria. An example of this categorization can be seen in Table 2, using test data. Once the categorization is complete the comments themselves are removed from the table. The focus is on the types of comments raised, and thus the privacy of what the students chose to say can be maintained.

<table>
<thead>
<tr>
<th>Comment</th>
<th>Concern</th>
<th>Type</th>
<th>Area</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am having trouble understanding how the loops work.</td>
<td>Coursework</td>
<td>Negative</td>
<td>Languages (PHP)</td>
<td></td>
</tr>
<tr>
<td>It is very different than in visual basic.</td>
<td>Other</td>
<td>Descriptive</td>
<td>Languages (VB, PHP)</td>
<td></td>
</tr>
<tr>
<td>But I have enjoyed working with my partner on the assignment.</td>
<td>Assignment</td>
<td>Positive</td>
<td>Assign 2, Group Work</td>
<td></td>
</tr>
<tr>
<td>I would appreciate more direction on the specifications, though.</td>
<td>Assignment</td>
<td>Request</td>
<td>Assign 2, Specifications</td>
<td>Provided more information in lectures</td>
</tr>
</tbody>
</table>

Table 2: Sample of data analysis, stage 1 (test data)

Number and Frequency of Submissions

The students were expected to submit ten journal entries over the teaching period. Access to the journal system was provided two weeks before the expected start date for the journal (which was week 3), and continued for four weeks after the lectures were over, for a total of nineteen weeks (given that weeks 9 and 10 were the mid-semester break). Assignments were due in week 11 and again in week 18. Naturally, it should be emphasized that a) the quality of the submissions is far more important than the quantity, and b) the sample size is too small to draw any general conclusions.

As far as the number of posts is concerned, during this period nine, or 64.3%, of the students completed ten or more journal entries, while two students were significantly under the required number of submissions. This can be interpreted as a limited success.

Figure 4: Number of posts submitted and students submitting (grouped by week)

Due to the previously discussed BSDI experiences, of equal concern prior to starting the course was the frequency of the entries. This proved to be unfounded. The majority of the students, 75.8%, submitted their entries at approximately the expected frequency of slightly under one per week.
Overall, the web-based system did seem to, as expected, encourage the students to add more-or-less the required number of entries to their journals on a more-or-less regular basis. As a result every week found significant and useful information being entered into the journals. The key element to this success was arguably the date-stamping. The students knew that their entries were automatically recorded against their names, and that as a result the course coordinator would be aware of the frequency and number of their postings. Nevertheless, questions remain regarding the effectiveness of the system when applied to larger sample sizes, and the effectiveness when compared to other reflective journal systems. These questions lie outside of the scope of this paper, but may be worth returning to at a later date.

**Did the Journal Assist in Course Evaluation?**

Given the wide scope of the question, analysis will focus on three key topics that are of particular relevance to the course. These are:

- Did the students have the expected expertise, and, if not, were attempts to counter this successful?
- Were the course materials covering the setup and configuration of the software sufficient?
- Did the multimedia lectures that were placed online assist the students?

Each question will be examined against the data harvested from the journals.

**HTML Expertise**

In the first week of lectures, the students were asked if anyone in the class did not know HTML. None of the students responded to the question, and therefore it was assumed that HTML would not be an issue. The journals told a different story. In the first four weeks of the course, there were 164 distinct claims made in the journals by the students. Of these, 10 comments, or 6.1%, directly concerned HTML, and comments about HTML appeared in 16% of the entries that were posted. Approximately half of the comments concerning HTML were classified as actions – in other words, at least a third of the students had found that they didn’t know HTML sufficiently well and would therefore have to act in order to improve their knowledge. This led to two conclusions.

1. Asking the students if they knew something in class was not the best approach to finding out what they actually did know.
2. HTML would need to be covered in some form during the course. In this case, the lecture in week 5 was modified to include a simple HTML primer.

In week 5, after the lecture, only one journal entry made a comment concerning HTML, and that comment was positive. This suggests that the lecture may have been successful in addressing some of the student’s concerns. HTML did not return as an issue for the rest of the course, at least so far as the journals were concerned.

**Software Setup**

As the course involved the use of various software packages, the students were provided with a CD-ROM so that they could work from home, rather than being entirely dependent on access to the computer lab. In order to assist with this the first practical involved setting up and configuring Apache and SSI on the lab computers, while the second practical involved configuring Apache to work with Perl. Given this, it was hoped that the practicals and the step-by-step guides that were handed out would be sufficient to allow the students to do the same at home. This clearly was not the case. Comments in regard to the setting up of software continued into week 7. According to the journals, almost half of the students had significant trouble setting up the software on their home computers, and four students were unable to install the software at all. As a result students were encouraged to bring their computers to the campus, where the coordinator took them through the installation process. Clearly this is a problem that will need to be tackled in more detail when next the course is offered.

**Multimedia Lectures**

In week 3, as a result of noticing in the journals that a number of students had missed the first lecture, it was decided to try placing multimedia versions of the lectures online. These lectures were created using Agility Presenter, which creates web-based audio/visual presentations. The coordinator then watched the journals for any feedback. There was almost none. Only four comments were made about the presentations, all by the same student. Admittedly they were all positive, but this can’t be viewed as an overwhelming success. However, discussions with students revealed that they appreciated the online lectures, and would like to see them continued – they just didn’t feel the need to report this in their journals.
This emphasizes the problem with unfocused evaluation techniques – specific issues, such as these online lectures, may simply not be addressed. Tightly focused techniques, such as questionnaires, are considerably stronger at tackling these sorts of issues.

**General Impact**

In all, 18 changes were made to the course content and the way the course was taught as a direct result of comments made in the journals. These ranged from alterations in the handouts, through to the inclusion of additional material online, and extended to a change in the focus of some of the lectures. Overall it was felt that the use of the journals results in significant changes to the course that were appreciated by the students and resulted in an improved learning experience for all of those involved.

**Did the Highlighting Mechanisms Work?**

The primary aim of the highlighting tools was to flag the entries where a large number of negative comments were occurring, so that those comments could be addressed immediately wherever possible. To evaluate the success of this, each entry was analyzed in terms of the progress recorded and the ratio between negative, positive and descriptive comments. Figure 3 is the result.

As can be seen in Figure 3, the percentage of positive comments did, in general, improve as the student’s progress went up. The major exceptions to this occur when the students rate their progress as quite low. This appears to be because of two factors: 1) very few students rated their progress at this level, with almost all students moving between a low of about 4 and a high of about 8; and 2) a minority of students viewed the progress rating in absolute terms, and thus their progress steadily climbed over the course of the semester. It is suggested that in future students could do with further instructions about how to rate their progress in order to improve overall consistency.

It is interesting to note that the progress rating proved to be more valuable after analysis than before. Initial readings of the journals suggested that low progress scores were going to be the result of personal issues or problems with other courses, rather than issues to do with the course at hand. This proved not to be the case. In the end, personal issues only made up 4.2% of the comments, and problems with progress tended to be more to do with issues encountered in following course materials than with the impact of other courses.

Further research will examine in more detail both the effectiveness of the progress rating and the use of the mood indicator, but initial findings suggest that although the progress rating was effective, to some degree, it cannot be relied upon; while the mood indicator was largely ineffective as the mood of the students was more a product of their overall situation than the course itself.
CONCLUSIONS AND DIRECTIONS FOR FURTHER RESEARCH

The reflective journal proved to be extremely valuable in the teaching of the course, as it ensured that students provided feedback on a regular basis about their learning experiences. This feedback covered a lot of ground, and allowed a number of changes to be made to the course as it was being taught, which arguably resulted in a better learning experience for the students. Furthermore, a number of lessons were learnt from the journals about broader issues, and these will result in a quite different course the next time it is run. But all was not perfect. Although the journals functioned as a CEI, and were useful, the usefulness was largely due to the small class size which made it possible for the coordinator to handle the amount of information coming through; and the flexibility of the course structure, which allowed for rapid changes. In order for reflective journals to be useful when teaching medium-to-large classes, it would seem that at the very least additional effort has to go into finding methods of flagging significant entries. Furthermore, it is questionable about the effectiveness of the journals in encouraging the students to reflect – although there was some evidence of reflective activity, there was also evidence that students did not read their earlier entries, and thus were not necessarily reflecting on their actions.

All of this suggests an ongoing program of research. First, there is cause to further explore the effectiveness of different methods of highlighting significant journal entries. Second, there may be methods of designing the journals to measure and encourage reflection. On the measurement side, it may prove valuable to count viewings of journal entries by students. On the encouragement side, there might be methods of giving students cause to reread their journal entries. Suggested methods include the addition of a “reflections on last week” field, and the ability for lecturers to leave comments for students under their entries. Third, it would be worth exploring what fields should be included in the journal, and what combination would be the most effective for the students. Finally, it would be interesting to continue the work of Lynch and Metcalfe (2003) by exploring the impact different audiences may have on the way the journals are employed by the students.

The success of the journals has encouraged a number of different courses to embrace the online system that was developed for this project, resulting in the development of version 2 of the software. In semester 1, 2004, five IS courses at the same university were employing the system in their teaching, with two of those courses focusing on the use of the journal as a CEI. An additional course was employing the journal system to experiment with an online shared journal for those teaching the course. More courses will be employing the journal in semester 2, and data collected from these courses will be employed to better evaluate the tool in general as well as examine and refine more specific aspects of the journal system. The software itself has been released as an ongoing open source project (Journ-E) so that other universities can explore the implications of the system, should they so desire. Overall, it would be recommended that this type of journal system be employed in any course where regular feedback would be valuable, but where the class sizes are small enough to permit those running the course to keep track of the posts. Arguably the ideal class size would be between 10 and 30 students, but further work on the flagging tools may increase this number.

REFERENCES


