Developing Critically Thoughtful, Media-Rich Lessons in Science: Process and Product

Philip Balcaen
University of British Columbia, Okanagan, Kelowna, Canada
philip.balcaen@ubc.ca

Abstract: In this paper, I describe a professional development approach and a conceptual framework used to create critically thoughtful and media-rich science learning resources. Greater clarity about the nature of critical thinking and how to support teachers in learning to implement it are needed if we are to respond to broader calls for critical thinking both as a central goal in science education and as a key aspect in the ecology of 21st Century e-learning environments. The conceptual framework is a model of critical thinking developed by the Canadian Critical Thinking Consortium that involves embedding the teaching of five categories of intellectual tools into the teaching of curriculum content. The "tools for thought" include addressing the need for focused and relevant background knowledge, criteria for judgment, thinking concepts, thinking strategies and the development of habits of mind. The professional development approach engages practicing teachers through focused inquiry groups in collaboration with rich media technicians to develop the e-critical challenges (lessons). Aspects of this "comet approach" include a series of face-to-face sessions, gradual and planned for introduction to use of laptop computers, developing inquiry oriented writing teams and expert mentorship between large group face-to-face sessions. I explain the unique aspects of both the development process and the challenges in the context of a project involving twelve teachers in the creation of media-rich critical thinking lessons in science for Grade 7 students. Although project assessment data analysis is currently underway, I offer several initial conclusions in relation to the four goals of the project.

Keywords: Critical thinking, science teaching, media-rich, professional development, one-on-one laptop, collaboration

1. Introduction

Many institutions such as the National Academy of Science in the US, provincial Ministries of Education in Canada, the Queensland Board of Secondary Study in Australia, educators in India and China and others identify critical thinking (CT) as a desired goal for science education (Balcaen 2006). However, as Nobel Laureate Carl Wieman (2006) observes, conventional science classrooms from elementary school through to university are generally failing to provide most students with opportunities to think about and understand science. He goes on to argue that carefully constructed e-learning opportunities can help with this dilemma. Speaking from the perspective of cognitive science, Willingham (2007) argues that teaching critical thinking is a means of improving scientific thinking while engaging more powerfully with the factual content. Based on his work with several thousand Canadian and international teachers, Case (2005) takes the position that, rather than compete with the teaching of subject matter and other thinking skills, teaching critical thinking can support their development. Case also argues that this support depends on two distinguishing features allowing teachers to place critical thinking “on the main stage”—using a curriculum embedded approach and emphasizing teaching the intellectual tools required for critical thinking. These two features underpin the approach to teaching science and CT described below.

In addition, proponents of e-learning argue that critical thinking should play a central role within the ecology of 21st century e-learning environments (MacKnight 2000; Garrison & Anderson 2003, Drinkwater et. al 2004). Despite these and other strong urgings, too little attention has been paid to “how” this goal might be accomplished (Balcaen 2008). The literature suggests that rather than improving thoughtfulness, participation in e-learning often leads to confusion and loss of interest unless there are strategies designed to enhance CT opportunities (MacKnight 2000). Drinkwater et. al. (2004) add that one of the challenges for ICT users is to understand how e-learning technologies can “improve thinking.” Based on extensive research, Finkelstein et. al. (2006) conclude that research-based simulations can be “as productive, or more productive, for developing student conceptual understanding as real equipment, reading resources, or chalk-talk lectures” (p.1).

Those involved in the project described here believe that such simulations and other rich media combined with a sound method of teaching CT, can help teach critical thinking while also teaching content knowledge. This approach differs from the normal one where teaching thinking is considered an add-on or enrichment activity. As Case (2005) and Willingham (2007) posit, it makes no sense to try to teach content without giving students opportunities to think about it and also makes no sense to try to teach CT devoid of content.

The development project, Embedding Critical Thinking Methods within Science 7 Online Teaching and Learning, described below, is our initial attempt to address using media-rich on-line resources to embed...
critical thinking “while” addressing science content goals. The project involves collaboration between The Critical Thinking Consortium’s (tc2), COOLSchool’s successful use of emerging media-rich technologies and an opportunity provided by a School District’s (www.sd23.bc.ca) implementation of a one-on-one laptop initiative. The three “initial goals” of the project include:
1. providing effective in-service about teaching critical thinking for participating teachers;
2. enhancing teacher’s expertise in use of media rich technologies;
3. and improving the effectiveness of laptop use Grade 7 classrooms.

Following the narrative framing the project, I provide a description of the development process, explain the pedagogical framework including examples of teacher-developed lessons, outline our limited successes and problematic aspects of the development process and the e-challenges, and finally offer several concluding comments.

2. Framing the project

The current project began as a “spin-off” from The British Columbia Central Okanagan’s overarching one-on-one initiative focused on “improving the quality of e-learning opportunities for Grade 7 students” by providing effective in-service for teachers. Central Okanagan is a small school district comprised of 29 elementary, 6 middle and 5 senior secondary school students enrolling approximately 22000 students. The district has invested heavily in various e-learning technologies. Recognizing that a “one-on-one” (placing laptop computers in the hands of all students) project would not magically transform teaching and learning, an administrator from the district invited the author and a team to work with interested teachers to include critical thinking as an explicit improvement goal in their practices.

The initial plan provided for a two-year in-service training program involving four elements of tc2’s professional development work with teachers:
- Regular face-to-face sessions where teachers were taught about aspects of the tc2 approach
- A gradual move towards a focus on use of laptop computers to support teaching CT
- Organizing curriculum writing teams around common interest areas of inquiry
- Providing school-based mentorship for the inquiry teams between large group sessions

This approach to professional development takes account of the criticism of conventional curriculum development practices where facilitators “workshop” teachers who are then expected to return to the classroom and infuse new ideas into practice. This understanding of professional development is widely viewed as having limited value in transforming practice (Cranton and King, 2003; Fullan, 2002; Fullan, 1996; Wideen, 1994). The approach taken here is constructed around an alternative understanding borrowed from Field Programs at Simon Fraser University’s Faculty of Education. This “comet” approach conceptualizes workshops as only the head of the comet where participants are introduced to a set of ideas about teaching CT but then adds providing teachers with time away from the classroom and support such as peer review opportunities and mentorship to help develop effective curriculum—constituting the tail of the comet. This approach has been highly successful in tc2’s work with teachers in India, Hong Kong, the USA and across Canada.

A spin-off of the “Critically Thoughtful i-Learn” project is a common interest group of science teachers working to use rich media to teach science. This partnership involves tc2’s curriculum specialists using the innovative method of embedding critical thinking within conventional text-based curriculum, the educational media development group COOLSchool’s success using emerging technologies to develop and deliver curriculum and a group of twelve science teachers from the school district. This partnership led to the addition of the following fourth goal to the overarching i-Learn project:
4. The development of a collection of media-rich elementary science lessons (deliverables) including elements of The Critical Thinking Consortium’s approach to teaching the tools for thought.

2.1 The deliverables

Specifically, the development project is to develop 12 multimedia and feature-rich science (Grade 7) lessons intended to better engage individual and groups of students in science learning, support their development as critical thinkers and encourage effective use of emerging technologies. The e-based critical challenges (lessons) address the newly developed BC elementary science curriculum and are now available for general
use after and may be viewed at http://www.tc2.ca/wp/. The science curriculum is similar to that used in many other jurisdictions in Canada and elsewhere making the critical challenges useful for many teachers.

The e-based critical challenges present the science curriculum in a “problematic” way requiring that students learn and use elements of five categories of “intellectual tools” elaborated on later. While proven to be highly engaging, this approach helps students develop the tools needed to address Nobel Laureate Carl Wieman’s (2006) concern that most science students are not learning what we hope they are learning; they aren’t learning to think about the curriculum.

The format of the critical challenges takes advantage of current Internet technology involving use of multimedia content including flash animations, simulations, and interactive media pieces to better engage students and support science concept development. From his research into science teaching, Wieman (2007) observes that the use of such technology offers the hope of some revolutionary improvements in education for all students, whether they’re going into science or anything else. We expect that as teachers and individual students become comfortable using the critical challenges as intact lessons, they will begin to edit and re-author materials adding their ideas to improve and extend their science teaching and learning. In this way, the feature rich project is intended to fortify teachers’ abilities to use new technologies and offer online students and teachers more engaging material to enhance distributed learning experiences while teaching thinking.

3. The development process

The process was organized into three phases—knowledge and community building, curriculum development though inquiry and final revision phases—outlined below. During phase one, September 07 to March 08, tc2 provided face-to-face in-service for contracted teacher-writers and then met with smaller groups to help develop text-based outlines of the Science 7 critical challenges (lessons). This involved contracted teacher-writers and COOLSchool design expert’s working collaboratively then meeting with the author to critique and edit works in progress. While taking full advantage of COOLSchool’s current expertise, these initial face-to-face sessions helped build competence with the tc2 model and allowed for collaborative design of the media rich aspects before being piloted by other teachers.

Phase Two was a piloting and evaluation period from March 08 to June 08 involving 12 Grade 7 teachers (elementary and middle school) piloting and critiquing the e-based critical challenges. Towards the end of this phase, I collected quantitative and qualitative feedback about technical (i.e. navigation, ease of use, accessibility, multimedia features) and pedagogical aspects (i.e. engaging; conceptual clarity, support collaboration) of the critical challenges to inform changes during the final revision phase.

Phase Three involved revisions during the July /08 to September /08 period in preparation for release of the materials in October 08. During this phase the team collaborated to take account of feedback from the piloting teachers and to make revisions to the pedagogical and technical aspects of the challenges using standards set by tc2 Senior Editors, COOLSchool media developers and the following British Columbia Digital Learning Content Standards for Distributed Learning (2007).

- experienced educators plan the learning activities
- effective teaching strategies are used to engage students
- the lessons employ a variety of approaches to learning addressing different learning styles
- the design activates prior knowledge of the learner
- the design is suitable to the cognitive and memory load of the learner

During the first year of general use we intend to collect feedback from both classroom teachers and individual student users about the technical and pedagogical features of the challenges as a means of further improving the lessons and following through on our commitment to writing quality curriculum.

4. Conceptual framework: The four fronts

The tc2 approach to critical thinking is founded on the belief that people are attempting to think critically when they thoughtfully seek to assess what would be sensible or reasonable to believe or do in a given situation. This need to reach reasoned judgments may arise in countless kinds of problematic situations such as the following examples developed by teacher-writers.
Based on the findings around the "crime scene", what do you think is the defensible factor leading to a decrease in salmon populations?

Using the information provided, develop an urban area plan with least negative impact on the surrounding natural environment.

Using the tools provided, determine which member of a food web would have the biggest impact on the web if it were removed?

Outline the most ecologically responsible land use plan for the outlined area.

Which form of rock, sedimentary, metamorphic, or igneous has added the greatest value to human experience in the 20th century?

Which member of the food web would have the biggest impact on the web if it were removed?

These situations require critical thinking because there is some doubt as to which is the most appropriate of several plausible responses and because these situations involve criterion thinking (e.g. ecologically responsible, feasible, biggest impact, most effective, least negative, greatest value). It is important to note that the focus is on the “quality of thinking” and not on a requirement that students must arrive at “the correct answer.” The power of the model is that it offers four coherent fronts providing a method for encouraging, teaching, and assessing the qualities of good thinkers.

The tc2 conception of critical thinking outlined in Figure 1 and described below, focuses teachers on four fronts to help students improve as thinkers: 1) providing challenging questions, 2) teaching required intellectual tools, 3) assessing the intellectual tools, and 4) supporting the development of communities of thinkers.

![Figure 1: The four fronts](Used with permission from tc2)

4.1 Asking challenging questions

The first front is infusing opportunities to think critically by asking the kinds of complex questions identified above—what we call challenging questions. This involves the development of a question form that requires judgment between viable alternatives; involves subject matter that is meaningful to students; addresses key aspects of the curriculum; and require that students either possess or can reasonably acquire the thinking tools needed to competently address the challenge. For example, the question on the right in Table 1 below is such a challenging question. This question contrasts with the two other kinds of questions commonly found in textbooks, on the Internet and within classrooms. These are:

- questions merely asking students to express “how they feel” about something
- or basic knowledge questions asking students to regurgitate basic science content knowledge
Table 1: Kinds of questions

<table>
<thead>
<tr>
<th>Basic Knowledge Questions</th>
<th>How do you feel questions</th>
<th>Intellectually Challenging Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>List four examples of igneous, metamorphic and sedimentary rocks.</td>
<td>What are your favourite igneous, metamorphic and sedimentary rocks?</td>
<td>What are the most valuable examples of igneous, metamorphic and sedimentary rocks found on the earth?</td>
</tr>
</tbody>
</table>

Such “challenging” questions are the key invitations encouraging students to engage with the curriculum more enthusiastically and to thinking critically—base decision on warranted criteria—about it.

4.2 The tools for thought

The second and most crucial front is helping students nurture the use of five categories of intellectual tools used by competent thinkers. Much of what makes this approach unique and powerful is the explicit focus on the development of these tools within learning activities and the complimentary assessment process. Below, I define each category and provide linked examples based on several of the challenging questions listed earlier.

- **Background knowledge**—the information about a topic required for thoughtful reflection about a solution to the question. Here students learn about the life cycle of salmon and both natural and man-made factors threatening salmon survival. In one of four activities, they learn the details about four important factors known to have a significant impact: human garbage, over fishing, storm drain and water run off pollution, and stream habitat destruction. [http://coolschool.ca/TC2/TC2_projects/TC2_01.htm](http://coolschool.ca/TC2/TC2_projects/TC2_01.htm)

- **Criteria for judgment**—the considerations or grounds for deciding between viable alternatives. The example provided is part of the “What key factor do you think is the most responsible for the increase or decrease of the carbon dioxide levels in the atmosphere?” challenge. Here the criteria for judgment is the most responsible factor including a variety of “sources” and “sinks” effecting the total concentration of CO\textsubscript{2}. Students participate in activities using the above criteria allowing them to assess the relative impact of the various factors. [http://coolschool.ca/TC2/TC2_projects/TC2_04_files/CO2Challenge.htm](http://coolschool.ca/TC2/TC2_projects/TC2_04_files/CO2Challenge.htm)

- **Critical thinking vocabulary**—the range of concepts and distinctions that are helpful when thinking critically. The example provided is part of the “What key factor do you think is the most responsible for the increase or decrease of the carbon dioxide levels in the atmosphere?” challenge. Within this challenge, there are both science specific and thinking specific concepts needing to be taught. The example linked below involves teaching the concept of a CO\textsubscript{2} “sink.” Other examples of thinking vocabulary used within other challenges include assumption, evidence, inference, fact, hypothesis, and argument. [http://coolschool.ca/TC2/TC2_projects/TC2_04_files/bathtub/index.htm](http://coolschool.ca/TC2/TC2_projects/TC2_04_files/bathtub/index.htm)

- **Thinking strategies**—organizing devices, models, and algorithms useful in making a decision. In this case, the example provided is part of the “Which member of the food web would have the biggest impact if it were removed?” challenge. The web of effects illustrated provides information then used to help make a sound judgment based on justifiable criteria. Other examples of strategies include identifying positive and negative factors, comparing similarities or differences rating and ranking options. [http://coolschool.ca/TC2/TC2_projects/TC2_02_files/theweb.html](http://coolschool.ca/TC2/TC2_projects/TC2_02_files/theweb.html)

- **Habits of mind**—the values and attitudes of a careful and conscientious thinker. For example, students have to be consciously open-minded as they consider evidence that might oppose their opinions and fair-minded as they consider different possibilities as they work to answer the challenging questions. At the same time, making an argument might include being independent-minded as students look for more information to help make a decision.

Together, these five categories provide a comprehensive and extensive list of intellectual tools that support the development of sound thinking abilities. While I have included only a few examples for each category, tc2 has identified many examples of each category found in the e-resources [http://www.tc2.ca/wp/electronicsourcebook](http://www.tc2.ca/wp/electronicsourcebook) @ Alberta Learning Resources.
4.3 Assessing for thinking

The third front is regular assessment of students’ competence in using the intellectual tools to think through responses to challenging questions. This requires the careful development and use of appropriate criteria and standards to assess students’ background knowledge; use of the criteria for judgment, thinking vocabulary, thinking strategy, and habits of mind. Each challenge includes criteria and standards in rubric form for self/peer/teacher assessment of aspects of the lesson. Other examples of approaches to assessing aspects of critical thinking may be found at http://www.onlineguide.learnalberta.ca/content-og/ssocirm/html/smchartsummary/index.html

4.4 Building critically thoughtful communities

The fourth and final front is building communities of thinkers where the focus is on developing thoughtful classroom, institutional and broader communities where critical thought is a goal. For classrooms, this involves instructors regularly posing questions and developing assignments requiring students to think through the implications of what has been learned; creating ongoing opportunities to engage in a critical and cooperative dialogue; employing peer and self evaluation; and modelling use of the critical thinking tools. I discuss the implications of this aspect of the model for distributed learning communities found at http://www.ejel.org/Volume-5/v5-i3/v5-i3-articles.htm.

The technology resources developed for this project are provided for two target audiences: individual distributed learners and teacher-use with their conventional classes. While the focus on this community aspect is not addressed for individual learners. The modular nature of the e-critical challenges allows teachers to use the complete lessons or to repurpose objects and activities and to embed them into their own teaching resources. In this way, teachers may fit the challenges into their own practices and support development of more thoughtful communities within their classrooms.

I argue here and elsewhere that taken together, these Four Fronts provide a coherent approach to practice supporting teachers with a method of modelling and teaching critical thinking.

5. Addressing the goals

The three initial goals of the overarching Critically Thoughtful i-Learn project were assessed through the collection of project baseline and exit data using mixed methods involving two surveys (Inventory of the Pedagogy of Critical Thinking & The Critically Thoughtful iLearn Questionnaire), interviews and direct observation. Exit data was collected in June 2008, compared to base-line data and reported in a Final Project Report to the Central Okanagan School District that will be the basis of an upcoming paper reporting the research in detail. Below, I provide aspects of the data linked to my discussion of the four goals of the project.

5.1 Goal 1

While several teachers have participated in the in-service about teaching CT and computer use and then moved on to other things, a core group (N=18) of self-selected participants are using the ideas within their practices. These teachers are integrating CT methods with their use of lap top computers. This is evident in their development and use of e-challenges identified earlier and other computer-based teaching activities we observed within their daily practice. In their meta-analysis, Sung and Lesgold, (2007) identify three key factors limiting such increased use of computers in classrooms. These are 1) high expectation on the part of policy makers versus lack of preparedness on the part of teachers; 2) high availability of technology versus low use in conventional classrooms; and 3) on-going advances in technology versus teachers’ tendency to keep doing what they are already doing.

In this case and as indicated by Q. 1-3 on the iLearn Questionnaire, there were no “statistically significant” changes in participants’ knowledge of and attitudes towards use of laptops. However, this is the expected outcome as these “volunteer” teachers joined the project because they already had high skill levels and were motivated to use laptops in their practice. One teacher’s comment sums up the group’s general point of view. She suggests that laptops “just open up the whole world of research for our students. You know, if a student wants to know something about the world, it’s just there at their fingertips.” In addition, all of these participants suggested in the base-line survey data that computer use in general had a positive impact on their teaching.
However, when we take account of the descriptive data and field observations it is clear that these teachers gradually used their laptops in different ways as they implemented critical thinking methods. One participant described this shift in practice when stating, “I think that students are getting a much deeper understanding...but it’s not something that I’m just telling them. They’re discovering it through use of electronic media as they do their critical challenges.” Despite being predisposed towards computer use these teachers run against the grain when considered in relation to Sung and Lesgold’s three factors.

5.2 Goal 2

The issue of enhancing teacher’s expertise in use of media rich technologies has been evident during “sharing works in progress” sessions held at the end of day-long or after-school in-service events. Several teachers have demonstrated what Sung and Lesgold (2007), call “instructional maturity” which is evident when they integrate new and emerging technologies into their practices. During these sharing sessions participants often began collaborating with others to use and extend newly developed understandings about various applications such as Google Earth and various simulations.

The research form the project shows that “collaboration” with other teachers was chosen by 57.7% (Table 2) of respondents when asked to identify “the best” source of help as they implemented use of laptops in their classrooms. Based on comments within our qualitative data, the important role the collaboration played in teacher learning is not about being dissatisfied with those providing technical assistance but rather a comment on how these teachers learned most effectively through collaborative inquiry with their colleagues—a key aspect of this approach to professional development. (An explanation of the table is found below.)

Table 2: Frequency of each category of possible help according to participant choice.

<table>
<thead>
<tr>
<th>Category</th>
<th>First Choice</th>
<th>Second Choice</th>
<th>Third Choice</th>
<th>Fourth Choice</th>
<th>Fifth Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaboration</td>
<td>15 (57.7%)</td>
<td>2 (9.1%)</td>
<td>1 (5.9%)</td>
<td>0</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>CoolSchool</td>
<td>2 (7.7%)</td>
<td>1 (4.5%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Workshops</td>
<td>2 (7.7%)</td>
<td>4 (18.2%)</td>
<td>7 (41.2%)</td>
<td>0</td>
<td>1 (16.7%)</td>
</tr>
<tr>
<td>Technology</td>
<td>5 (19.2%)</td>
<td>11 (50.0%)</td>
<td>6 (35.3%)</td>
<td>5 (55.6%)</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>Tech Support</td>
<td>1 (3.8%)</td>
<td>3 (13.6%)</td>
<td>1 (5.9%)</td>
<td>1 (11.1%)</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1 (3.8%)</td>
<td>1 (4.5%)</td>
<td>2 (11.8%)</td>
<td>3 (33.3%)</td>
<td>1 (16.7%)</td>
</tr>
<tr>
<td><strong>Total Number of Participants</strong></td>
<td><strong>26</strong></td>
<td><strong>22</strong></td>
<td><strong>17</strong></td>
<td><strong>9</strong></td>
<td><strong>6</strong></td>
</tr>
</tbody>
</table>

Explanatory Note: For this question, responses from both the base-line and exit groups were looked at together. Therefore, the sample consisted of 29 participants each eligible to list five “help” sources. Responses were coded into one of 6 categories. The first category was Collaboration, this category included all responses in which the participants mentioned collaborating or talking with other colleagues. The second category was CoolSchool, which included all references to CoolSchool (the rich media consultant group.). The third category was Workshops, which included all references to workshops or professional development opportunities. The fourth category was Technology, which included all references to software programs, the Internet, or specific websites. The fifth category was Tech Support, which included references to technical support. The final category was Other, which included responses that did not fit the other categories. Such responses included “journals,” “research,” and “playing around on my own” for example.

5.3 Goal 3

The goal of improving the effectiveness of laptop use in Grade 7 classrooms was addressed through the exit data collected in June. In addition, during our interactions with teacher participants and writers we observed use of a greater variety of software (i.e. Google Earth, various web-based simulations and COOLSchool’s on-line materials) as well as examples of dramatically increased frequencies of students’ use of laptops. These uses include accessing information about subjects being studied; representing their work—making presentations to the class and using design-related applications; using various forms of social software, and providing digitised peer assessment information to assess each other.

The qualitative data indicates that throughout phases two and three computer applications in combination with CT methods had a dramatic positive impact on teachers’ use of the laptops. Some even experienced
what might be seen as transformation in their understanding of teaching practice. As one teacher explained
when comparing his new and old approaches to teaching, “I had less variety in lessons before, it was more
your typical teacher at the front and do these computer activities. And now …there’s more variety and like I
said, I’m more aware of the level of thought that the students need for their work.” Another participant
described how reverting to old methods “feel[s] like I’m cheating the students.” Another sees the approach to
teaching thinking as learning to “coach thinking” as students use their laptops. A fourth participant talked
about teaching critical thinking as teaching a set of tools and that her “role is about teaching them tools…to
think critically.” Finally, one participant identified the ultimate goal of such an approach saying that
implementing CT methods is about “creat[ing] a community of thinkers” in the classroom.

Several participants acknowledged the difficulties they had in learning about the tc2 approach and
implementing it within their practice. For example, one wrote “Despite being an experienced teacher, I feel
like a novice when it comes to using critical thinking,” while another stated that “I find that thinking of and
setting up a challenge or focus question is the most difficult.”

The researchers’ field observations and work with participating teachers confirms the views expressed
above. Teachers struggled to learn about teaching CT and about integrating the methods into their use of
laptops but persisted and in many cases changed their practices. Results from The Inventory of Critical
Thinking Pedagogy indicates “significant” improvements in several areas.

A total of 17 participants completed the intake inventory and 10 participants completed the exit inventory.
Participants were asked to assess their pedagogy of critical thinking on a scale with values of 1 (novice), 2
(aware), 3 (familiar), 4 (capable), 5 (adept), 6 (fluent), and 7 (master). A series of ANOVAs were conducted
to identify significant statistical changes in participants’ self-assessment of the pedagogy of critical thinking
between the intake and exit questionnaires. The analyses showed that there were no significant statistical
changes between participants on the following categories:

- Nurturing classroom expectations about thinking \( F(1, 25) = 3.493, p = .073 \)
- Teacher modelling of good thinking \( F(1, 25) = 1.749, p = .198 \)
- Using classroom communication to enhance thinking \( F(1, 24) = 0.754, p = .394 \)
- Nurturing habits of mind \( F(1, 25) = 2.002, p = .169 \)
- Teaching critical thinking vocabulary \( F(1, 25) = 3.013, p = .095 \)

However, analyses did indicate that there were “significant” increases in participants’ self assessment of the
pedagogy of critical thinking from the intake inventory to the exit version on the following questions:

- Establish classroom routines to support thinking \( F(1, 25) = 4.364, p = .047 \)
- Teaching the tools for participation in a “critical” community \( F(1, 25) = 4.284, p = .049 \)
- Incorporating criteria for judgment \( F(1, 25) = 27.055, p = .000 \)
- Developing background knowledge \( F(1, 25) = 13.345, p = .001 \)

While these teachers have much more to learn about the integration of CT methods into their use of laptops,
they have made significant changes and with support from their peers and others can develop a high degree
of expertise.

5.4 Goal 4

The major focus of this paper, the development of a collection of media rich elementary science e-challenges
deserves consideration of both process and product.

The process, based on the comet model outlined earlier, has involved several unique aspects resulting from
the e-learning dimension of the critical challenge. First is the expectation by teachers that session facilitators
make use of rich media approaches during their sessions. This resulted in a hybrid form of workshop
approach where facilitators engaged participants in the collaborative critique of several tc2 projects using e-
learning approaches (i.e. www.canadianmysteries.ca/indexen.html and digital examples www.onlineguide.learnalberta.ca/content-og/ssocirm/html/summariesoftheccs/index.htm). The participants
benefitted from lessons learned as these hybrid sessions informed aspects of their e-challenges by providing
ideas and examples of what is possible.

Next, we found that teachers had a difficult time writing curriculum from an individual learner’s perspective
rather than from the more conventional teacher’s view. This difficulty seemed to reflect the required shift in
practice that some participants spoke of—the shift from a teacher-centred classroom to one where students
are more at the centre of things because of their use of technology. In their work at MIT, Dori and Belcher
(2005) found that such a student centred or “active learning” classroom combined with technology use had a significant positive effect on science learning and we hope this will be the case with the e-challenges when they are used more generally by teachers.

The third aspect is time. School District and Inukshuk funds provide for releasing teachers from their classrooms to write the e-challenges and to meet and collaborate with rich-media experts. Surprisingly, many of the writers were reluctant to leave their classrooms and sometimes chose to use evenings and weekends to work on their challenges. This resulted in an extended development time-line and limited opportunities for collaboration across the group. Despite these limitations, and to their credit, teacher writers found time to develop their ideas and met with media designers after school hours as problems arose. One group committed to regular after school sessions for a period during the implementation phase.

The fourth aspect making the in-service process unique was teachers’ general inability to visualize the technological possibilities associated with their lesson ideas. This aspect was addressed by providing exemplars from COOLSchool’s prior work and more importantly bringing teacher-writers and technology design technicians together to “imagine the possibilities.” As shown by the e-challenges, this form of collaboration between experienced science teachers and design experts resulted in ideas that are doable and that meet the needs of Grade 7 students.

The products (e-critical challenges) also involve significant differences when compared to most conventional lessons. Aside from the obvious differences between print and web accessed materials, the challenges offer a unique approach to learning. They provide a method for classroom teachers to place critical thinking, as Case (2005) suggested, “on the main stage.” Although Case did not mean it in this way, we see the new “main stage” as the Internet. The modular nature of the challenges allows teachers to be selective and have individuals or groups of students use particular strategies within lessons to help teach about criteria for judgment, or specific thinking concepts, or habits of mind. For “distance” learners the challenges provide engaging opportunities to think about the curriculum in ways they may otherwise only experience in a classroom setting. This opportunity begins addressing MacKnight’s (2000) concern about finding ways of improving thoughtfulness in e-learning environments and Drinkwater’s (2004) challenge to use e-learning technologies to “improve thinking.”

Despite our excitement about the e-challenges described here, I have reservations about several aspects of their use. First is the concern raised by Case (2005) that teaching critical thinking needs to become embedded in teaching across the curriculum as opposed to the “added on” approach found in many classes, textbooks and e-resources. Developing the e-critical challenges only provides an opportunity to embed teaching critical thinking while these lessons may still just be used as “add-ons.” Second, is the opportunity provided by the modular structure of the challenges—the fact that individual parts can be used independent from the complete e-challenges. The building background knowledge module might be used in a conventional approach to teaching while the “tools for thought”—using criteria to make judgments or distinguishing between observations and making inferences or paying attention to detail—are neglected altogether. Finally, is my concern that a lack of background knowledge and understanding about the tc2 approach to teaching thinking will prevent classroom teachers and distance learners from using the e-challenges effectively. We hope that data collected during the first full year of use will provide some further insight and possible solutions to these concerns.

6. Concluding comment

In the paper, I have outlined the development process and provided a short description of the science e-critical challenges produced by participating teachers with linked examples to illustrate the outcomes of the project. The “comet” approach involving inquiry, on-going support and collaboration between practicing teachers and media developers was successful despite several limiting factors such as available time, tension between use of individual learner’s perspective and the teacher’s, and visualizing technological possibilities. The success is evident in the development of the critical challenges (lessons) produced and in the limited significant changes in teachers’ practice as a consequence of participating in the project. The e-challenges provide a method for classroom teachers to place critical thinking on the new “main stage”—the Internet, and the modular nature of the challenges allows teachers to be selective about aspects of the lessons while offering distance learners pedagogically superior opportunities to “improve thinking.”
Acknowledgements

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Distinguishing the Field of Educational Technology

Laura Czerniewicz
University of Cape Town, South Africa
Laura.Czerniewicz@uct.ac.za

Abstract: Drawing on what researchers and professionals in the field internationally report, this paper reviews educational technology as an emergent field. The review reveals the continuum of perspectives on what the field is, and how it is bounded or fragmented. The paper describes the field from two perspectives: the professional and scholarly and considers how the forms of knowledge differ and overlap in each domain. It posits some dichotomies which may frame the field such as science/ social science and positivist/ post-modernist. Finally the paper provides conceptual frameworks for distinguishing fields from each other and suggests what the categorisation of the field might mean, especially considering its emergent status in a rapidly changing context.

Keywords: Educational technology, e-Learning, profession, discipline, field, knowledge

1. Introduction

This paper considers the field of educational technology in terms of its nature and its distinctiveness. Drawing on the views of researchers and professionals in the field itself, the paper reviews the forms the field takes, and describes the basis on which it can be differentiated from other fields. That educational technology is an acknowledged field around the world is not in doubt. It is called a young field by numerous researchers (Conole, Dyke et al., 2004, De Vaney & Butler, 1996, Dueber, 2004, Jones, 2004, Luppicini, 2005) and acknowledged as a field across the world: from Portugal (Coutinho & Gomes, 2006) and Spain (Graells, 2004) to South Africa (Czerniewicz, Ravjee et al., 2006) and Australia (Alexander, Harper et al., 2006).

Although there is general consensus that the field exist, its nascent state is evident in the lack of agreement about its name. Depending on context, community and related factors, it may be called by such variants as Elearning, Networked Learning, Telelearning, Instructional Design or Telematics. An umbrella term, educational technology –one increasingly common- is used in this paper, and encompasses the activities and knowledge domain where education and technology intersect.

While such activities and such a domain are acknowledged to exist, there is disagreement about the extent to which the field is coherent, contained and bounded. Impressions of the field seem to lie along a continuum, ranging from a perspective on one end which considers the field to be unified with common postulates, ranging to a version of the field as one coming out of its infancy to a point of maturity where it is possible to seriously formalise it. The far end of the continuum sees it as fragmented and incoherent.

The “unity” view is framed by a belief in consensus, and agreement about the nature and precepts of the field. Thus a confident statement from Dutch researchers asserts “the consensus about substantial elements of the knowledge base and about the nature of I.D [instructional design]” (Elen & Clarebout, 2001) and related views align themselves with a Kuhnian version of a field which states that “Despite occasional ambiguities, the paradigms of mature scientific communities can be determined with relative ease” (Kuhn, 1962). The most explicit of these positions is expressed by Merrill and the ID Group who insist that:

*There is a scientific discipline of instruction and a technology of instructional design founded on this science. Like all science, the science of instruction is based on specific assumptions about the real world. The technology of instructional design is founded on scientific principles verified by empirical data. Instructional science is concerned with the discovery of the natural principles involved in instructional strategies; and instructional design is the use of these scientific principles to invent instructional design procedures and tools (Merrill, Drake et al., 1996).*

Another view is that the field is “growing up” and is ready to reach agreement on key elements. An example of this process to reach agreement regarding the rules and elements of the field can be seen in a 2006 IT (Instructional Technology) Forum paper which set out to explicitly formalise and confirm key aspects of the field. The authors invited the more than 2000 members of 45 countries (at the time) to “a dialogue about the specific language of instructional design and some new ideas we’ve developed about how to describe our field.” They “propose that Instructional Theory has now reached a level of development where a common
knowledge base with a consistent terminology would greatly facilitate the future development of knowledge in this important area” (Reigeluth & Carr-Chelman, 2006).

Another perspective is expressed by authors noting and decrying lack of coherence in the field. The field has been described as “amorphous” (De Vaney & Butler, 1996) and “disjointed” (Bruce & Levin, 1997). The fluidity of the field in Australia led two authors to suggest that it is hard to distinguish the field from any other related field. They said that the current enterprise has neither simple nor singular parameters that distinguish it from other disciplines or fields of study (Hedberg & McNamara, 2002). Another Australian article begins with the suggestion that there is virtually no body of knowledge underpinning work in the field.

Despite the fact that e-learning research (variously referred to as Computer-Based Learning, interactive multimedia, online learning etc at different times) has a history of some 50 years, there is little evidence of the emergence of a “body of knowledge” to support practice in the field (Alexander et al., 2006).

And finally, on a note of despair is the doubt that the field exists at all:

Given the available evidence, it unfortunately does not seem to be an overstatement to claim that professionals of all types in the field of IDT, including academics, practitioners and students, do not see the field as having a consensus definition, clear focus, distinct boundaries, established links between research and practice, or any obvious added value when compared to other fields (Bichelmeyer, 2004).

One might have thought that location on the continuum of perspectives would be clustered by specific groupings, countries or location: this is not the case. The range of views - the differences and agreements - regarding the coherence of the field is spread across the globe.

2. The field as professional

Simultaneously and in overlapping ways, a new professional field is coming into being and a new knowledge field (or professional discipline) is emerging. The differentiation is not clearly demarcated because in educational technology, the scholars and professionals in the field may well be the same people. A profession is associated with an occupation, and often with specific sites (such as law with the courts). What adds confusion to the emerging profession of educational technology is that the university is one of the key contexts in which that occupation is located (the others being schools, and other sites where training and education take place). It is likely that professionals are employed in universities on non-academic conditions of service, thus differentiating those working as academics in the new scholarly field in some ways. Depending on the status of the practitioner’s position, the work may be invisible and professional knowledge unacknowledged.

Attention is increasingly being paid to professionalisation of the field especially in the UK and the US (Beetham, Jones et al., 2001, Oliver, 2003, Richey, Fields et al., 2001, Surrey & Robinson, 2001). This work addresses matters such as competencies, job standardisation, career paths, sanctions, accountability and so on. The process of formalising job descriptions is still relatively new itself. While career paths were only mapped in 2001 in the UK (Beetham et al., 2001), the US has been setting out the competencies of the work for years, with the third edition of the key text in instructional design competencies being published in 2001 (Richey et al., 2001). The professional demarcation and the regulation of professional knowledge are key indicators of the emergence of the professional field, since professional knowledge is certified and credentialled (Weber, quoted in Macdonald 1995).

While knowledge is central, in both the professional and the scholarly, its role and focus differs. Professions are knowledge based occupation described as a form of cultural work where the tasks addressed are human problems amenable to expert advice (Macdonald, 1995). Professional work is thus distinguished from other work by the fact that it is underpinned by abstract knowledge (Macdonald, 1995). In a scholarly field, knowledge - through production, synthesis and dissemination - is the raison d’etre with the goal or outcome being academic knowledge itself.

The kinds of knowledge valued and foregrounded in the professional and the scholarly, will both overlap and differ. Thus understanding the field requires engaging with the different forms and expressions of professional and scholarly knowledge. What do professionals in the field do and know and how do they

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2 It has been noted that the field in the UK is now reaching a second generation division of labour Conole, G. 2004. The Role of Learning of Learning Technology Practitioners and Researchers in Understanding Networked Learning Networked Learning 2004 (Sheffield,
communicate that knowledge? What are the differences between the way knowledge is experienced and expressed in scholarly and professional contexts? Writing in the field of teacher education, Hargreaves (1996) differentiates the different forms of knowledge (see table below) and lobbies for a new order where professional knowledge is regarded as a valued resource.

<table>
<thead>
<tr>
<th>Epistemology</th>
<th>Scholarly Knowledge</th>
<th>Professional Knowledge</th>
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<tbody>
<tr>
<td></td>
<td>generalised</td>
<td>context-specific</td>
</tr>
<tr>
<td></td>
<td>codifiable</td>
<td>difficult to codify</td>
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<tr>
<td></td>
<td>rational</td>
<td>also moral and emotional</td>
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<tr>
<td></td>
<td>public</td>
<td>private or inter-personal</td>
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<td></td>
<td>written</td>
<td>oral</td>
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<tr>
<td></td>
<td>explicit</td>
<td>tacit</td>
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<tr>
<td></td>
<td>question-oriented</td>
<td>practical</td>
</tr>
<tr>
<td></td>
<td>propositional in form</td>
<td>metaphorical, narrative in form</td>
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Adapted from (Hargreaves, 1996)

The existence of substantial research over many years is testimony to the importance of tacit knowledge in professional practice. In educational technology this is an important and neglected area of study in two ways, as we need to analyse both how educational technology professionals express and share their knowledge, as well as how technology mediates forms of knowledge within professional academic communities.

Rare commentary on these issues in the educational technology literature is found in Jones who draws on the work of Barley and Orr to suggest that educational technologists may draw on new knowledge but not produce it (Jones, 2004). This raises a crucial point about the relationship between research (knowledge production) and professional practice with one view in the field of educational technology decrying the lack of research and theory to inform and support practice (Alexander et al., 2006) and another concerned that “instructional design theory is not grounded in practice” (Bichelmeyer, 2004). This too raises issues worth of research attention i.e. the relationship between research and policy; and the relationship between research and professional practice.

Ironically, because the field is so new and so rapidly forming as technology shifts, the gap existing between professionals and scholars may not be as wide as in other fields such as teacher education. It is quite possible that new knowledge may be emerging from professional fields in ways that needs to be tested by scholarly research, rather than the other way round, as is the usual assumption.

A useful way of categorising professions in relation to academe has been suggested by Greaves who suggests the following typology (Greaves, 2007):

1. Profession Type 1: Emerges outside the university and then moves into it e.g. law, accountancy and medicine
2. Profession Type 2: Emerges outside the university and remains outside the university e.g. estate agents. Such types have professional bodies and a knowledge domain, but it are not studied as a scholarly undertaking.
3. Profession Type 3: “Near professions" eg trades with tacit knowledge, accreditation and professional bodies, eg artisans and traders boiler makers fitters and turners
4. Profession Type 4: Emerges inside the university, gains status and moves out eg business studies through modern business schools
5. Profession Type 5: Emerges inside the university and stay inside – this results in a close relationship between communities of practice and scholars eg higher education studies or higher education leadership studies

Where might educational technology be located? Assuming it to be framed by higher education issues and in that context, it would be an example of Type 5. Whatever the classification, the challenge is to ensure that different forms of knowledge and new practices feed into one another. Its very emergence makes this more difficult, and viewing the field in its scholarly form may provide a more accessible lens.

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3. The field as scholarly

The most common way to describe a scholarly field in a higher education institution is as a discipline. A discipline has been described as

[...] a relatively stable and delimited field, easy to identify, has an academically and socially recognised name (e.g. found in library classifications) inscribed in institutions, labs, universities, international journals, conferences, procedures (Bourdieu, 2004).

and

The term, discipline, is usually reserved for areas of inquiry and application that have been established over time and follow established paradigms. There is likely to be a consistency in their basic beliefs, rationales and common principles that define the scope and structure of the discipline (Ely, 1999).

Stability, recognition and boundaries are therefore generally associated with the concept of a discipline. Given that these are still so contested, it is unsurprising that educational technology seems more often referred to as a field than as a discipline.

Yet the field is also described in disciplinary terms of one kind or another. Thus, a discussion paper published on an online forum makes the case forcefully that it is a discipline and indeed a scientific one. The paper opens with the statement that, “There is a scientific discipline of instructional design” (Merrill et al., 1996). Elsewhere it is referred to as a relatively new discipline (Conole et al., 2004) or as a new “inter-discipline” (de Laat, Lally et al., 2005), multidisciplinary (Whitworth & Benson, 2004) and inter-disciplinary (Jones, 2004).

The distinctions between these terms are relevant to a framing of the field. Stathern usefully disentangles them when she defines multi-disciplinarity as the alignment of skills from different disciplines but interdisciplinarity as involving a common framework shared across disciplines to which each contributes its bit. She says that “interdisciplinarity …is …a tool (a means) to address problems (Strathern, 2005).

She suggests that trans-disciplinarity involves bringing disciplines together in contexts where new approaches arise out of the interaction between them, but to a heightened degree. “The focus is on [the] context of application, and on a particular approach to problem-solving as one which creates its own theoretical impetus”; trans-disciplinarity requires “a common theoretical understanding” and a “mutual interpenetration of disciplinary epistemologies” (Gibbons et al., 1994: 29). Here the reach into core disciplinary practices carries the expectation of new theoretical models and new institutional forms.

By this definition, the achievement of trans-disciplinarity would mean the creation of and consensus about a new, in-depth shared paradigm for educational technology. As can be seen from this review, there is no evidence of any such consensus or such depth. Therefore the terms inter and multi disciplinarity prove more promising to describe the ways that educational technologist draw on and contribute to allied disciplinary fields. Exactly how this is manifest is worthy of research attention.

The consequences of the field being inter-disciplinary must therefore also be considered. It has been observed for example that because educational technology draws on so many disciplines, the community of educational technologists may only be familiar with “feeder disciplines”, each of which has its own theoretical domain, and indeed these outlooks may be incommensurable (Jones, 2004). He adds, crucially that there is no one meta-theory linking the feeder disciplines or unifying the discipline internally, confirming that the field cannot be called transdisciplinary.

Indeed, some researchers regard this ability to draw on associated disciplines as both desirable and necessary:

I think in general we need to break down disciplinary barriers and view ourselves as a community examining issues and learning from one another. How do we break down those barriers – what is there to learn from one another? That is the first question. Then the question is how do we promote a culture change to change the focus from “defining instructional technology” to identifying important issues to be studied. And also identifying where other work is being done on those issues – finding collaborators (Duffy, 2003).

and

In reflecting on one’s discipline it is important to draw on closely related and even distally related disciplines to both inspire new ideas and sharpen boundaries….A discipline that draws on its own
practices as the primary inspiration of its research and theory risks stagnation and decline (Kozma, 2000).

and

The discussion so far suggests that research in open and distance learning needs to be grounded in theory, that there are often benefits in drawing theory from outside narrow educational confines and that research will suffer unless this is done (Perraton, 2000).

This approach is a problem for those who have taken a traditional empiricist view of the field, as succinctly expressed by a well known US professor:

Those persons who claim that knowledge is founded on collaboration rather than empirical science, or who claim that all truth is relative, are not instructional designers. They have disassociated themselves from the technology of instructional design. We don’t want to cast anyone out of the discipline of instructional science or the technology of instructional design; however, those who decry scientific method, and who deride instructional strategies, don’t need to be cast off; they have exited on their own (Merrill et al., 1996).

Although this statement may appear extreme, the aspiration for the field to be considered as a science with a single overarching paradigm as the natural sciences are believed to have, seems to be a common one. There are however, many researchers who consider the field to be a social science with all its attendant challenges:

The field of Educational Technology shares many of the same struggles in defining itself and substantiating its foundations, as do other social sciences and applied social sciences. (Luppicini, 2005).

and

Research into e-learning brings together a broad range of social science researchers (Whitworth and Benson et al 2004).

The issue is not yet resolved. This observation made almost two decades ago remains true today:

It is unsurprising that the tensions between the sciences and humanities antecedents are manifest in the field. In some circles this is expressed as a tension between what is called learning sciences or behavioural science and between physical and technological sciences (Banville & Landry, 1989).

The tension is also expressed as a positivist/ modernist and post-modern dichotomy. On the whole the most significant cluster of approaches to scholarly work in the field internationally could be described as positivist. (This impression itself would be worth verifying.) However, there is a cluster of research examples which are based on post modernist principles and argue that post-modernist approaches provide valuable lenses to the field (Bryson & de Castell, 1994, De Vaney, 1998, De Vaney & Butler, 1996, Hlynka, 2003). These views argue for pluralism, criticism rather than evaluation, constant rethinking of beliefs and technology, a focus on power relationships and the highlighting of the relationship between corporate interests and technologies in the classroom (De Vaney, 1998, Hlynka & A, 1992).

As a field educational technology (often in the guise of instructional technology or instructional design) is most established in the USA where it has been observed that six studies from 1970 to 1994 have already examined its identity as a field (Carr-Chellman, 2006). The USA is the only place where books on the nature of the field have been written; interestingly those too tend to refer to the field rather than to the discipline. It is of note that the more recent books Instructional Technology, the Definition and the Domains of the Field (Seels & Richey, 1994) and Educational Technology The Development of a Concept (Januszewski, 2001) refer predominantly to the field as professional and applied. While this might suggest that their focus is largely on professional knowledge and domains, the references to research agendas and to scholarly pursuits also suggest that the overlaps of the professional and scholarly in the US are substantial.

4. Differentiating knowledge fields

Academic fields or disciplines are defined partly in terms of what they are not, how they are distinguished from other fields or disciplines. Although writing about the formation of anthropology, Clifford’s observations are pertinent. He notes that a discipline most actively defines itself at its edges, in reaction to what it says it is not. It does this by selectively appropriating and excluding elements that impinge, influences that must be managed, translated, incorporated. It draws lines to mark frontiers (Clifford, 2005).

Classifications may be expressed in different ways, ranging from structural to bureaucratic to theoretical.
The way the universities are structured may be crucial to the identity of the field in terms of where it is located and concomitantly where it is not located. Clifford notes that structural issues are linked to ‘disciplinary patriotism’ and that disciplines are sub cultures of a wider polity, in this case the university. The setting of such boundaries is not a neutral activity. Using Bourdieu as a lens to understand the scholarly field of Career, Lellatchitch et al argue that a field is a social sub system based on historically generated system of shared meaning. The boundaries of a field are where the effects of empirical research cease to have meaning, where the stakes of the game lose their impact (Lellatchitch, Mayrhofer et al., 2001). Educational technology research, courses and new departments may be located in education departments, in computer science departments or in media studies departments. In South Africa it has been noted that they are increasingly located in higher education development structures or higher education studies (Czerniewicz et al., 2006). Given that structural location may significantly determine the influences a field is both exposed to and identified with (and thus what becomes valued), such structural decisions may have profound effects on the nature of the field in certain settings.

The way that bureaucracies are organised may also be key determinants in field formation. The classification schemes of state information systems or research body clusters may play a role in the development of a field’s identity. Indeed, government and funding organisations devise systems to suit particular agendas (White & Liccardi, 2006); the location or indeed the invisibility of educational technology is these classifications is also worthy of research attention. In South Africa for example, disciplines are classified under the 2004 Classification of Educational Subject Matter (CESM) taxonomic coding scheme (Education, 2004). This organises subject matter into 22 (first order) categories and a wide variety of categories to the fourth order. State funding is partly determined by CESM classification (the Teaching Input Grid being a dimension of the funding formula), with for example the social sciences receiving half of the funding of the physical sciences. A new Masters in Educational technology programme located in Computer Science would receive more state funding than the same programme located in Education. Thus which kind of science the field is defined as being, has profound resource implications, as well as identity implications.

The most common classification within higher education for differentiating disciplines was developed by Biglan in 1973 (Biglan, 1973a, Biglan, 1973b) and extended and popularised by Becher and Trowler in their book Academic Tribes and Territories (Becher & Trowler, 2001). Biglan’s original classification suggested three dichotomies, with the three continuums being: practicality (Pure/applied); paradigm development (Hard/soft); and object of study (Life/non –life). Biglan has, however, been used for studies on ICTs and disciplinary differences ; and Biglan and Becher’s frameworks have been used to classify the associated fields of computer science and information science (Clark, 2003, Webber, 2003).

Another fairly common classification scheme, Whitley’s, is also long-standing and still in use today (Whitley, 1984). Whitley distinguishes between fields on the basis of task certainty/ uncertainty and strategic certainty/ uncertainty. This refers to the degree of problem variability and instability which influences the conduct, coordination and control of research in the field. While Whitley’s framework has not been used to map the field of educational technology, it has been valuable in descriptions of the related field of academic development and computer science (Bath & Smith, 2004, Clark, 2006, Moses, 1990).

Finally, disciplines have been distinguished on the basis of whether they are convergent (with tightly knit and clearly defensible boundaries) or divergent (with ill defined boundaries)(Becher & Trowler, 2001), with educational technology clearly providing an example of the latter.
Field identity formation means distinguishing the field from that which it is not. The differentiation process occurs through strategic, resource and conceptual strategies and categorisation processes, none of which are neutral. While the overt boundary-setting process is still in its early stages in the educational technology field, it is evident that approaches to setting the parameters in the field are varied. The common approaches described briefly here provide pointers to an area requiring closer attention.

5. Conclusion

This paper has sketched the terrain as it is perceived by those working in the field internationally. The internal dimensions of the field - its community structures, journals and conferences – have not been reviewed here; the focus has been a consideration of scope, parameters, borders and classification. This nascent professional discipline or inter-discipline is taking undoubtedly shape, inevitably marked by the dichotomies and contradictions demonstrated in the paper. By showing the more common taxonomies of field differentiation, ways of distinguishing the field have been suggested.

Why does all this matter? Newcomers being inducted to the field need to know the parameters of the field and its knowledge base. Members of the research and professional community need to agree where their shared areas of interest, focus, approach and projects lie. Clarifying some of the bigger picture issues raised in this paper will help build a shared language. Agreement of the key elements of the new domain, and professionals from such a wide range of backgrounds, coherent articulation and integration are necessary. While field formation cannot be prescribed, the process can be made explicit. Sufficient consensus is needed to enable communication amongst educational technology researchers and professionals, and in order to build a credible, legitimate and distinguished knowledge field.

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IT Worked for Us: Online Strategies to Facilitate Learning in Large (Undergraduate) Classes

F. Greyling1, M. Kara2, A. Makka2 and S. van Niekerk2
1University of the Witwatersrand, South Africa
2University of Johannesburg, South Africa

fran.greyling@wits.ac.za
mkara@uj.ac.za
amakka@uj.ac.za
jsvn@icon.co.za

Abstract: Higher education institutions are compelled to accommodate growing class sizes as student numbers have increased over time, especially at undergraduate level. Good teaching principles are relevant to all class sizes. For example, teachers of all classes are required to create safe learning environments, motivate and engage students, interact with students, provide stimulating assessment tasks and give prompt feedback. However, meeting these requirements in the context of large classes is more challenging. As a result, traditional large class teaching methods are often characterised by the passive absorption of material, which is not ideal.

What constitutes a large class? Class sizes of 60 or more have been considered large. In this paper, we report on online teaching, learning and assessment strategies for classes made up of approximately 600 first year students in Business Management 1 offered at the University of Johannesburg, South Africa.

The purpose of this ongoing research project is to integrate educational technologies in the classroom and study the impact of these classroom changes on the students’ learning experience. The programme, which blends face-to-face teaching, paper-based teaching materials and online learning by means of WebCT/Blackboard tools, is now in its second cycle of implementation. This teaching strategy aims at greater lecturer-student interaction, engaging students with the course materials on a regular basis and eliciting feedback from students, which is used to re-teach concepts that the students find particularly difficult.

The blended learning strategy resulted in enhanced student perceptions of the quality of teaching and learning, and a significant improvement in student throughput. The findings and recommendations reported in the paper are based on student feedback, gleaned through online surveys, online artefacts created by students and lecturers’ classroom experiences.

Although the authors report on online teaching, learning and assessment practices that proved to be effective in large classes, many conclusions may be of relevance to smaller classes.

Keywords: large classes, e-Learning, assessment, evaluation, social presence, action research

1. Introduction

Ives (2000), who wrote A Survival Handbook for Teaching Large Classes, argues that “[i]t doesn’t take a rocket scientist or a poet laureate to know that teaching a large class is a very different set of challenges than we typically face in our other classes”. There is a global need to meet the growing demand for higher education (King, 2004) and South Africa is no exception.

Effective teaching in large classes does involve addressing the requirements of good practice relevant to all class sizes, but large classes offer a unique set of challenges, which put strain on lecturers’ resources. Although it is difficult to agree on the exact size of a large class, the term generally applies to classes with more than 60 students (Centre for Teaching Excellence, 2005). This paper reports on teaching, learning and assessment strategies for exceptionally large classes: in 2007, 3157 students were enrolled for the course Business Management 1A01 at the University of Johannesburg, with approximately 600 students in a class.

Lecturers who teach these classes experienced a considerable lack of lecturer-student interaction and could find little evidence that students continuously engaged with the course materials. Their goal was to renew their teaching-learning strategy with the aim to

- Involve students in the learning process
- Engage students with course materials
- Assess students on an ongoing basis
- Provide feedback more regularly

• Address learning needs and improve teaching through eliciting student feedback

• Personalise the learning environment by establishing a lecturer presence and lecturer-student interaction

In addition to the apparent negative impact of impersonalised education on student learning, the lecturers involved in this project were concerned about the fact that they taught first year students who were mostly newcomers to university life. Therefore, they also aimed to assist students to establish a learning method that supports success in Business Management. With the integration of technology in their classroom practice, they attempted to establish a pattern of class preparation, class attendance, engagement with course content and reflection on the teaching-learning process. This strategy is explained in more detail later in the paper.

While it was found that teaching large classes put forward certain obstacles, this paper will show that class size is not necessarily inversely proportionate to learning; it is not as simple as the smaller the class, the more students learn. Felder (1997) claims that “anything you can do in a large class you can do better in a small one”. Here it is argued that, in teaching, size need not necessarily matter. What really seem to matter are how concerned lecturers are about their students' learning, how much energy they put into the teaching-learning process and how competent and creative they are. The research reported here shows the effects of lecturers’ efforts to empower students to find information and create knowledge in self-regulating ways, and to become confident in the process.

This paper addresses the following research problem: how can eLearning technologies be integrated in large class teaching to enhance student engagement and student throughput. The purpose of the research is to inform practice and not primarily the extension of academic discourse on the subject of large class teaching. While the action described in this paper is grounded in learning theory, the research outcomes are aimed at an audience of higher education practitioners who can benefit from the practical guidelines presented here.

The research reported here concentrates on practical blended learning strategies with the aim of contributing to the innovation of classroom practice. The purpose of this brief contextualisation of the inquiry is to enhance the usability of the proposed teaching-learning strategies in other environments.

The higher education institution where this inquiry was conducted had been a traditional contact tuition provider until 2002 when it adopted a blended learning strategy and set up the infrastructure to support and sustain learning and teaching with technology on campus. This blended learning project involves 3157 students in Business Management 1A01, a course that is facilitated by three lecturers.

The lecturers involved found themselves looking for ways to innovate their teaching practice and explored the implementation of educational technologies as an option. Their main concern was a significant lack of lecturer-student interaction, which resulted in other challenges, such as poor throughput. An eLearning specialist was engaged in order to explore possible eLearning solutions as part of a multi-disciplinary team. Her role was to ground the use of technology in effective practice and pedagogies that enable technology-assisted learning, within the given teaching-learning context. The research project is in its second cycle of implementation.

The research reported here is guided by the principles of action research, with improved practice as primary focus. It is believed that some of the success of the teaching-learning innovation described here can be attributed to planning before action, followed by critical analysis. What follows next is a brief introduction to the research approach and a summary of how the steps in action research were implemented.

3. Strategies guiding the research

Given that the aim of this research is the renewal and improvement of existing classroom practice, action research was regarded as an effective method for inquiry. McNiff (1988: 50) argues: “Built into action research is the proviso that, if as a teacher I am dissatisfied with what is already going on, I will have the confidence and resolution to attempt to change it. I will not be content with the status quo”. Kemmis and McTaggart (2005) echo the notion that classroom action research typically involves the use of qualitative research methods and data collection by teachers who put their teaching methods on trial in an attempt to
improve their practice. The action research process is typically defined as a spiral of cycles of planning a change, acting and then observing the outcomes of the change, reflecting on the outcomes and finally re-planning the change. Kemmis and McTaggart (2005: 563) hold that action research is “best conceptualized in collaborative terms”, Altrichter, Kemmis, Mc Taggart and Zuber-Skerrit (2002) describe the action researcher as a co-worker conducting research with and for people concerned with a real-life problem and its actual improvement.

A multi-disciplinary team addressed the research problem presented in this paper. The team comprised three lecturers (subject matter experts) who provided contact tuition and facilitated course related activities in the online component of the course. The fourth member of the team was an eLearning specialist. The primary function of this role was to advise on the integration of technology with the aim of improving teaching and learning; it was not to promote the use of educational technologies. The research process was triggered by the lecturers’ dissatisfaction with poor student throughput in one of the courses that they teach. The lecturers explored alternative teaching-learning approaches, which resulted in the research team asking: how can educational technologies be utilised to enhance student engagement in large classes with the aim of improving throughput? A proposed eLearning solution was subsequently planned and put into action. The action was then evaluated. The research team reflected on the results of the evaluation, which led to a new cycle of planning, acting, observing and reflecting. Table 1 summarises the steps in the action research process, as described by Zuber-Skerrit (1991), in relation to the research project.
Table 1: Steps in action research related to this project

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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| Plan | This phase of the action research process includes the problem analysis and strategic plan. The lecturers, who initiated this research, were concerned about the lack of student engagement and interaction in large classes, which in their opinion contributed mostly to poor student throughput (58 per cent in 2006). The integration of eLearning technologies with face-to-face tuition was explored as a possible solution. Early in 2007 the lecturers were joined by an eLearning specialist to plan a new blended teaching-learning strategy which aimed at:  
  - effectively utilising educational technologies to enhance student engagement, interaction, assessment and feedback in large classes and 
  - improving the throughput rate for Business Management 1A01, while maintaining assessment standards and the cost-effective lecturing format of large classes. A detailed description of the new teaching-learning strategy is found later in this paper. |
| Act | “Action” refers to the implementation of the strategic plan. The new teaching-learning strategy was executed over a seven-week period during the first quarter of the first semester in 2007. |
| Observe | In this phase of the research process, the action is evaluated by appropriate methods and techniques. Since the aim was to make informed teaching decisions, the following sources of data were used to review the new teaching-learning strategy:  
  - Students’ questions, comments and feedback made in the presence of a lecturer  
  - On-line artefacts, such as discussion board postings by students and lecturers  
  - Lecturers’ reflections on the teaching-learning strategy  
  - Online survey statistics  
  - Online quiz statistics  
  - Electronic tracking of students’ online footprints and usage of the online materials and functionalities  
  - An online opinion and attitude survey administered on completion of the course |
| Reflect | Finally, action researchers reflect on the results of the evaluation, on the action as well as the research process. In this project the researchers attempted to reflect on the following issues:  
  - How did the students react to the new teaching-learning strategy and what did they do?  
  - Which aspects of the new teaching-learning strategy contributed positively to the students’ learning experience?  
  - Which aspects of the new teaching-learning strategy influenced the students’ learning experience negatively?  
  - How did the research team experience the new teaching-learning strategy and what did they do?  
  - What were the key learning points?  
  - What is the impact of the key learning points on the following cycle of implementation (strategies to ameliorate negative impacts and exploit positive impacts)? |

The purpose of reflecting on, and recording the outcomes of research cycles is, firstly, to liberate the research team from continuously repeating past mistakes and secondly to enable them to refine teaching practice. The following section unpacks the new teaching-learning strategy.
4. A new teaching-learning strategy

The new approach, which is characterised by enhanced engagement and regular assessment, also aimed at making the teaching-learning experience more enjoyable. The elements of the new approach were grounded in extant research findings about pedagogies that enable learning, and specifically online learning.

The decision to utilise technology for enhanced student engagement was based on the premise that students learn by being actively involved; the researchers subscribe to Merrill’s (2004) view that information is not instruction. MacDonald (2005) provides a useful definition of what makes learning active: “[A]ctive learning is a process whereby learners are actively engaged in constructing knowledge in a meaningful, realistic context through exploration, reflection and social discourse with others, rather than passively receiving information”. The teaching-learning strategy described here, pursued student engagement mainly through assessment with feedback as recommended by researchers, such as Angelo (2002), Brookhart (1999) and Wiggins (1998), and by establishing a social presence as suggested by researchers, such as Aragon (2003) and Salmon (2002).

Online learning technologies were implemented to help students engage with course materials, lecturers and other students in the following ways:

- Additional resources, such as lecture outlines were made available, which encouraged students to come to class prepared.
- More assessment opportunities (with immediate feedback) were provided in the form of online quizzes, without adding to lecturers’ marking load.
- Student feedback on the teaching-learning process was elicited on a weekly basis through online surveys, which could be interpreted quickly and easily.
- Channels of asynchronous online communication were created to facilitate interaction and collaboration.

The proposed eLearning solution was based on the principles of online teaching-learning models, such as those described by Garrison, Anderson and Archer (2000) and Salmon (2002). Salmon (2002), for example, builds her model of online teaching and learning on the assumption that learning is a complex interaction between cognitive, motivational, affective and social processes, which culminate in the development stage where students assume responsibility for their own learning. The first stage deals with pragmatic issues, such as gaining access to the online learning environment. During this stage, the facilitator provides support and creates a safe space that motivates students to participate. At stage two, students establish their online identities and find others with whom to interact. This stage sets the scene for course related collaboration. The facilitator provides ways to bridge the gap between known forms of behaviour and the rules of behaviour in the online environment. Stages three and four involve the sharing of information about the course and consequent construction of knowledge. The facilitator encourages students to use learning resources and initiates learning activities that require groups to work together to achieve specific outcomes, with the facilitator in a supportive role.

The elements of the new teaching-strategy are discussed below.

4.1 A recommended weekly learning path for students

The objective of the student-learning path was to establish a weekly rhythm of class preparation, class attendance, engagement with course materials and reflection on the teaching-learning process.

In order to enable students to prepare for an upcoming class, lecture outlines were published in the online course component at the beginning of a lecture week. The outlines provided key lecture points in a workbook format with white spaces for students’ own contributions. Students were encouraged to use the outline to guide their reading in preparation for lectures. Ideally, students would record their own comments and insights during preparation and in class. The outlines aimed to help students reflect on class discussion as opposed to anxiously copying their lecturers’ words and PowerPoint slide contents. Students were encouraged to listen actively and take meaningful notes, using the lecture outlines. The lecture outlines were a “stripped down” version of the PowerPoint presentations used during lectures; the notes contained only key points and other scaffolds, such as selected graphics and models.

Following lectures, students were asked to discuss the lecture with fellow students and/or study group members and then provide individual feedback to the lecturing team by completing an anonymous online
survey, which was referred to as the “muddiest point” survey. The muddiest point surveys attempted to establish the following:

- The “clearest” point of the week’s lecture (students selected the best-understood learning outcome).
- The “muddiest” point of the week’s lecture (students selected the least understood learning outcome).
- The extent to which the lecturer provided students with all the information needed to successfully complete the learning unit for the week (rated on a scale from zero to 10).

The student feedback was used to establish which learning outcomes had to be revisited during the following lecture. The data from the last question in the survey were used to calculate an average student satisfaction rating. These statistics were used as a “dipstick” measurement of and reflection on lecturing performance.

4.2 Enhanced engagement with course content through online quizzes

Students were expected to complete four online quizzes throughout the seven-week course. A compulsory mock quiz was included to allow the students to familiarise themselves with the quiz tool in the online course component. Each quiz covered two chapters in the prescribed textbook and each student was presented with ten quiz questions, which were randomly selected from a question database. The assessments were open-book and had to be completed within a short time, which required students to study, or at least read, the relevant chapters before they attempted the quizzes. Students received their grade and feedback on submission of the quiz in order to assist them to gauge their knowledge and understanding of the course material. Each student was allowed two opportunities to take the quiz and the highest score was recorded. The online quiz results comprised a small percentage of the students’ final mark for the course.

4.3 Adding a social dimension to the course

It was important that students visit the online course component regularly. One of the strategies to achieve this aim was to create a social dimension in the online course environment. Teaching with technology can easily be associated with cold and impersonal teaching-learning environments. Therefore, an effort was made to create a warm, personalised, inviting, visual and informative environment that was updated every week. The intention was to make the online course component an attractive and rewarding information-destination for students to visit at least once per week.

Maintaining the online social presence required the lecturing team to do the following:

- Update the course home page every week with concise and informative text and visuals, which were linked to an important learning outcome for that week.
- Encourage students to debate course-related issues in the discussion forum.
- Contribute to discussions.
- Continuously moderate student contributions to the discussion board.
- Promptly respond to student postings (within 48 hours).

The next section addresses the perceived impact of the new teaching-learning strategy on the students’ learning experience.

5. Results

The discussions in this section are based on data gathered from sources listed in Table 1.

The team approach to finding a teaching solution was constructive. All team members felt safe to engage in debates and discussions as equals with one common objective: to maximise student learning. The contributions regarding teaching and learning, made by the eLearning specialist, were perceived by the lecturing team as theoretically sound and simplistically elegant. It was evident to the lecturing team that the aim was to use technology to support and enable improvements in teaching-learning strategies; technology did not attempt to prescribe strategy. This soon cemented the eLearning specialist’s team membership as “a fellow expert” as opposed to an “outsider” or “support staff”. This perception supports other research claims that professional development practitioners, such as eLearning specialists, should be seen as a credible source and reliable advisor (Salmon, 2003; Zvacek, 2001).

The challenge that brought the multi-disciplinary team together in the first place seems to have been overcome: student throughput improved significantly in 2007. It is not claimed that the improved throughput rate can be attributed solely to enhanced engagement and assessment through the implementation of
technology. The use of online technologies formed part of a carefully planned blended teaching-learning strategy, which comprise a variety of variables:

- On commencement of the academic year a once-off, one-hour session on studying skills for students in the field of business management was presented by staff from the Learning Centre of the University of Johannesburg.
- Students attended a two-hour face-to-face lecture once a week.
- Lecturers set aside approximately 10 hours per week for one-to-one consultations with students.
- Short tutorial sessions, which were facilitated by third year Business Management students, were available to first year students who sought additional assistance.
- One two-hour revision class was scheduled prior to the summative, written assessment on conclusion of the course. Attendance was voluntary.

However, between 2006 and 2007 there were no significant changes in the following areas: learning outcomes, prescribed textbook, large-class lecturing format, face-to-face student support, scope of assessments, assessors and moderators. The only significant change was the new, blended teaching-learning strategy, which integrated technology in the classroom. Although it would be difficult to prove empirically, it appears as if the revised teaching-learning strategy could be a significant driver of improved student performance as outlined in Table 2.

### Table 2: Business Management 1A01 assessment results for 2006 and 2007

<table>
<thead>
<tr>
<th>Description</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average mark for on-line quizzes</td>
<td>56.1%</td>
<td>58.2%</td>
</tr>
<tr>
<td>Average mark for written test</td>
<td>50.2%</td>
<td>65.8%</td>
</tr>
<tr>
<td>Average term mark</td>
<td>50.6%</td>
<td>62.9%</td>
</tr>
<tr>
<td>Throughput</td>
<td>58%</td>
<td>80%</td>
</tr>
</tbody>
</table>

The final mark of a Business Management 1A01 student is determined by his/her performance in three different assessments, namely online quizzes (10%), one formal written assessment completed during the course (40%) and one final written assessment, or exam (50%). The relative weightings are in brackets. The improvement in assessment results in all areas is evident from Table 2.

In addition to a significant improvement in the throughput rate, student feedback indicates that the online course component was perceived as a useful tool. Despite the marginal increase in online assessment results, 55 per cent of respondents in the online opinion and attitude survey indicated that the online assessments (specifically the quizzes) assisted them "to a large extent" in achieving the course outcomes. Only three per cent of respondents felt it did not contribute to their learning.

Other, unprompted statements recorded under general comments in the survey reflect the students’ perception of how the online course component supported their learning, for example:

- "I would like to thank the business management team for making life so much easier for us through reducing ambiguity and letting us know what is expected of us. This is much better than any of the other subjects and I would like to see them [other lecturers] adopting the same system, it is proven to work."
- “Business management is the most understandable and interesting subject”
- “I find that the Business Management [WebCT] courses are some of the more impressive and user friendly of the [WebCT] courses I have. Keep up the good work!”
- "I have enjoyed the experience of using [WebCT] as a tool for learning in Business"

It also seems as if the required engagement of students with the course learning materials paid off. For example, one student recorded the following comment the online opinion and attitude survey: “The [WebCT] system ... requires consistency from students. I think that it will be an asset to this institution for years to come”. Students perceived the quizzes as useful, firstly because it “forced” them to revise the work covered during lectures before they attempted the quizzes. Secondly, students felt that the quizzes served as preparation for tests and exams by exposing them to the types of questions they could expect.

Students found the lecture outlines useful, for example, one student wrote the following comment in the online opinion and attitude survey: “Please do not take the lecture outlines away, but try add more important graphs and diagrams into them as it is difficult to draw them in the lectures. [WebCT] is a brilliant tool for us ...”
Students appreciated the fact that they were asked for their feedback on lectures and that their lecturers actually responded to the feedback. Below are comments taken from the online opinion and attitude survey:

- “We can voice whatever problems we have”
- “I got to inform my lecturers on what I did not understand without personally talking to them”
- “[The surveys] helped me to let our lecturers know what I didn’t understand - for them to elaborate again”
- “Other departments should look at also placing such surveys on [WebCT]”

If students did not know where to submit their feedback they asked, and received help from other students (note the humour built into the second response):

“How do we give feedback to the lecturer?”

“Click on assessment then on muddiest point survey 4 week 1”

“You speak very slowly to them :)”

“Hi! It’s under ASSESSMENTS! Cheerio”

Threaded discussion, posted to the discussion forum on 2 February 2007

It is evident that the online course component provided a platform for interaction and socialisation. In the online opinion and attitude survey one student commented: “I think [WebCT] is a great way of learning and it makes the work more fun as opposed to a black and white text book”. In this regard, social presence theorists claim that a social dimension is a critical element of any learning situation (Swan, 2003; Garrison et al., 2000) and that technology-assisted learning environments with a weak social dimension can even be harmful to learning (Kreijns, Kirschner and Jochems, 2003; Salmon, 2003). A strong social dimension in an online course is associated with enhanced student perceptions of the quality of online learning and students who feel at ease around their facilitators and other course participants are more likely to share information and learn (Greyling and Wentzel, 2007; Aragon, 2003; Swan, 2003).

The research cycle was concluded with an in-depth review session exploring the teaching-learning successes reported above, as well as the challenges, which will be addressed in the next research cycle. These challenges include:

- Insufficient team interaction; the multi-disciplinary team should meet more often to reflect on teaching-learning results in order to re-design course materials and activities responsively during the research cycle.
- Somewhat disappointing student response to muddiest point surveys; the weekly response rate remained almost constant at approximately 25 per cent. An attempt should be made to increase student involvement in this area, for example by using the completion of these surveys as a criterion for releasing other, useful course materials.
- Technical problems; for example, students often signed up to the wrong user groups, which caused a lot of frustration for the students who could, as a result, not access other relevant information. It was also a time-intensive exercise to re-assign students to the correct groups. Both lecturers and students should be supported to become more adept in using the online course tools.
- Navigation of the online environment; the online course component needs to be simplified to some extent.

6. Conclusion

This article explored ways of enhancing student engagement and assessment in large classes with the aim of improving the teaching-learning experience and maximising student learning. The research was initiated by a need to increase student throughput. A new teaching-learning strategy was implemented, drawing on the affordances of technology to increase student engagement and assessment within the parameters of a particular teaching-learning context. It was found that eLearning technologies made it possible to establish and maintain contact with students in large classes. Communication channels also provided a platform for student-to-student interaction. Automatically graded quizzes enabled continuous assessment in the course and helped students track their progress and improve their performance. Online surveys made it possible for students to provide feedback on the teaching-learning process, which was used by lecturers to improve on what they did in class.

It was shown that while technology is not an isolated contributor to student success, it can play an important role in students’ perceptions of the quality of the teaching-learning experience and seems to contribute
significantly to student throughput. These research findings have practical implications for the design, development and facilitation of learning in large classes.

References


Personal Learning Journal – Course Design for Using Weblogs in Higher Education

Stefanie Hain and Andrea Back
University of St. Gallen, Switzerland
Stefanie.Hain@unisg.ch
Andrea.Back@unisg.ch

Abstract: This paper examines the impact of weblogs on individual learning processes in a university environment. It outlines experiences with weblogs as an instrument of learning reflection or a learning journal. This paper presents an innovative didactical concept based on the Web 2.0 paradigm and evolving technologies.

Weblogs have emerged with the paradigm of Web 2.0 and user-generated content and have gained in importance through the various evolving application contexts, for example, the transfer of knowledge within enterprises, the communication and exchange of experiences with customers, and even the acquisition of projects by power bloggers. In this paper, weblogs are considered in the specificity of learning journals that focus on two objectives: first, supporting individual learning by means of reflection as the most effective method of individual learning; and, second, multiplying these efforts through interaction and discussion within a group of individuals with common interests. The latter is based on contribution-based pedagogies that maintain that collaboratively creating learning resources and sharing them with others are promising practices through which students can learn. Additionally, it is argued that this style of teaching relates to a growing trend in higher education in which the focus of learning is moving away from building a basic knowledge store and toward emphasizing a wider range of skills.

We successfully applied the weblog approach to several academic courses during which qualitative and quantitative data were collected in an empirical study. This paper reflects our experiences with weblogs as a support for university lectures and is based on four semesters of exploration and adaptation. Within the scope of the research approach of design research (Hevner et al. 2004), it provides a structured method to support individual learning processes within a learning community realized by a weblog in the specificity of a learning journal. Verification with students and experts has led to a holistic method through which lecturers and coaches can successfully integrate weblogs into academic courses or even professional trainings. This paper addresses both academic learning and professional education management initiatives. Essentially, it aims at in-house trainings in enterprises, vocational schools, and universities. Interviews with experts will also reveal how to successfully align this method with professional trainings.

In conclusion, this paper suggests a method with which to design a learning environment by means of learning journals to enforce increased individual learning. More specifically, it reveals that learning journals enable the achievement of level three (transfer to and application in the working environment) of Kirkpatrick’s (1994) four-level model, which was generated to evaluate learning programs.

Keywords: Web 2.0, weblog, learning log, learning journal, learning reflection, contribution-based theory

1. Introduction

A weblog (usually shortened to blog) is a knowledge sharing technology that enables people to record their thoughts in diary form and publish those diaries as web pages without programming or HTML coding (Du and Wagner 2005). Weblogs have emerged with the paradigm of Web 2.0 and user-generated content and have gained in importance through the various evolving application contexts, for example, the transfer of knowledge within enterprises, the communication and exchange of experiences with customers, and even the acquisition of projects by power bloggers. The case study, Hain and Schopp (2008), for example, illustrates the business impact of introducing an enterprise weblog system while simultaneously enforcing the transfer of knowledge and avoiding an information overload.

In this paper, weblogs are considered in the specificity of learning journals or learning logs that focus on two objectives: first, supporting individual learning by means of reflection as the most effective method of individual learning (Baumgartner et al. 2004); and, second, by multiplying these efforts through interaction and discussion within a group of individuals with common interests (Baumgartner et al. 2004, Röll 2005a). The latter is based on contribution-based pedagogies that maintain that collaboratively creating learning resources and sharing them with others are promising practices through which students can learn efficiently (Collis and Moonen 2001). Additionally, it is argued that this style of teaching relates to a growing trend in higher education in which the focus of learning is moving away from building a basic knowledge store and toward emphasizing a wider range of skills (Hamer 2006, p. 40).
We applied this approach to several academic courses. This paper reflects our experiences with weblogs as a support for university lectures and is based on four semesters of exploration and adaptation. Within the scope of design research (Hevner et al. 2004, Back et al. 2007), it provides a structured method with which to support individual learning processes within a learning community by means of a weblog in the specificity of a learning journal. This paper thus addresses both academic learning and professional education management initiatives. Essentially, it aims at in-house training in enterprises, vocational schools and universities.

The next section outlines the terms weblog and learning journal and the concept of a weblog in the specificity of a learning journal. Section three describes our explorative research that led to the method with which to design a learning journal environment to increase the individual learning benefit, which is described in section four. The transferability of this method, its limitations and related works are summarized in the conclusion.

2. Weblog in the Specificity of a Learning Journal

A weblog is a journal-like page (post) on a website. While such pages can contain photos or media, they are primarily focused on the ability to effortlessly post written thoughts to a website. The postings are organized chronologically. Normally, others can comment on a weblog post, which therefore facilitates a dialogue on the posting’s topic.

As already mentioned, weblogs are emerging in different types and contexts. Zerfaß and Boelter (2005, p. 5) categorized weblogs as knowledge, service, campaigning, CEO, product, collaboration, customer relationship, and crisis blogs. From this perspective, educational blogs should be assigned with knowledge blogs (Röll 2005b). Downes (2004) was one of the first authors to mention blogging in educational contexts by introducing terms like ‘edublogging’ and ‘learning 2.0.’ Some authors have discussed different types of weblogs pertaining to education: group and publishing blogs, journals of professional experiences, personal opinion and academic blogs, as well as research and learning journals (Bartlett-Bragg 2003, Baumgartner et al. 2004, Röll 2005a, Groß and Hülsbusch 2005). In most cases, the authors do not differentiate very precisely. Nevertheless, this differentiation presents a general conspectus of weblogs’ application possibilities in educational contexts.

As such, a learning journal or learning log is a systematic way of documenting learning and collecting information for self-analysis and reflection (Kerka 1996). However, a weblog is also an appropriate technology to apply when aiming at achieving interaction and discourse as it has various functionalities that support the essential human linkage and interaction. Röll (2005a) outlines the three roles that learning journal weblogs can adopt: as an information or knowledge storage, a reflection medium, and a discourse medium. As an information storage, a weblog enables learners to summarize and aggregate contents that may only be realized by hyper linking them. In addition, due to a full-text search is possible, the content need not be stored in a well-structured way (Röll 2005a).

As reflection and discourse media, learning journals are rather didactical approaches that can be realized by means of weblogs. Both reflection and discourse media are strongly dependent on the design of the learning environment. Reflection has been defined as a process of turning experience into learning (Boud 2001, p. 9). Some researchers argue that reflection is the highest level of individual learning (e.g., Baumgartner et al. 2004, Bartlett-Bragg 2003, Boud 2001) and learning journals are, moreover, used for self-reflection. The learner therefore externalizes new knowledge in weblog posts. Afterwards, the learner can refer to these posts and build on already learned knowledge assets. Simultaneously, the individual learning process is documented and may later be analyzed meta-cognitively (Röll 2005a).

To gain more insights into their learning process, individuals either have to network and communicate with others (discourse), or put their knowledge into action (Bartlett-Bragg 2003, Baumgartner et al. 2004, Du and Wagner 2005). This is in line with contribution-based pedagogies. Since weblogs are available to everyone, they can be used to discourse with others. Learners are thus offered opportunities, first to verify their thoughts by comparing them with other learners’ weblog posts; second, to comment on other posts; and, finally, to discuss common topics by referring to other posts (Böttger and Röll 2004, Röll 2005a). The latter is traceable via the trackback function, through which an author is informed if somebody has cited his post. However, this is only possible if the referring person includes the hyper link in the new post.
3. Empirical study

It is important to design an appropriate environment that will generate the conditions required to increase individual learning success to attain the effective reflection and discourse stages. Consequently, this study provides a framework that outline how learning journals can do so successfully. Table 1 provides a review of our four-semester long explorative investigations.

The study resulted from data obtained from three different courses over four semesters: Information Management, Instruments of Knowledge Management (twice) and Knowledge Management. The last three semester courses were presented at the University of St. Gallen (HSG) in groups of about 10 Bachelor undergraduates. Furthermore, all the courses were presented as regular lectures. In the first stage of the study, the posts that the students had to write were very strictly defined regarding their content, length, and the number of postings. These restrictions emphasize that students seem to be overwhelmed by a pre-defined amount of work, especially if, as in the case of the learning journal, this work is not the main task in their course. Later, we decided to reduce the number of posts and also offered the students a wider choice of lecture topics on which to provide posts. Subsequently, these measures proved to have a strong impact on the students’ level of satisfaction.

Wagner developed a 5-point schema with three interdependent dimensions to evaluate the quality of a weblog post: content (2 points), networking (2 points), and technology (1 point) (Du and Wagner 2005, Wagner and Back 2006). Content is the most important perceived value of a weblog and comprises facts, experiences concerning the relevant topic, individual reflection, and reflections in dialogue. The reflection criterion, especially in dialogue, provides a link to the networking dimension. Networking is characterized by internal or external web resources, as well as links to other students (blogroll) or reflective dialogues, and/or conversations (links in the text itself). Finally, the technology dimension focuses on designing the personal weblog in terms of layout (e.g., style, pictures, personality) and activated functions (e.g., polls, music, blogroll, RSS, tag cloud, chat). This dimension does not, however, seem to be relevant for individual learning processes. Nevertheless, visual cognition and user interaction increase the value of the content (Du and Wagner 2005).

In her study, Bartlett-Bragg examines a similar model called the 5-stage blogging process (Bartlett-Bragg 2003). This maturity model represents five levels of blogging behavior: establishment, introspection, reflective monologues, reflective dialogue, and knowledge artifact. Both Wagner and Bartlett-Bragg reveal that individual reflection is important, although communication with other individuals is of more benefit for individual learning processes.

The main objective of our research during each of the last three semesters was to stimulate the students to fulfill the three dimensions (content, networking, technology) regardless of whether their posts were graded or not. If this could be achieved, it would be possible to assume that weblogs could have a positive impact on individual learning. However, the successful application of weblogs in academic courses requires a holistic method with which to design a learning journal environment. Among others, such a model has to specify the role of the coach, the dramaturgy of the course, and additional instructions that the students require.
4. Designing a learning journal environment

Based on our explorative research, this section describes a method for designing a learning journal environment to increase the individual learning benefit. In this approach, ICT or, more specifically, weblog technology is used as part of a blended learning initiative, which implies that the academic, the lecture itself, and additional learning materials can definitively not be substituted by the use of blogs. First of all, the academic takes on the role of coach. A key aspect of coaching is providing scaffolding, which comprises the support (in the form of advice and reminders) that learners require to approximate the execution of an entire
range of skills. Once the learner has grasped what the target skills are, the coach reduces his participation (fades), thereafter only providing limited advice, refinements, and feedback while the learner practices the smooth execution of the entire range of skills (Collins et al. 1987, Reusser 1995).

Figure 1 presents the assumed relation of the method (below) and its impact on the individual learning curve (above) over one learning period (semester). In this research, the amount of increased learning cannot be quantified, although we have determined that the amount can be influenced positively through: first, the motivation of the learner; second, the ability of the coach to motivate and support; and third, the established dramaturgy of the course.

Motivating learners starts with the kick-off event of the cyclical lectures. The coach clearly communicates the expectations and requirements, the learners are introduced to the idea of learning journals, and are made aware of special aspects like the quality of a weblog by, for example, presenting extracts of the vlog series “Learning Waves from Hongkong” (Wagner and Back 2006). Moreover, the coach imparts his experiences of recent courses, as well as providing the students with the learning journal assignment (LJA) and the relevant deadlines. The course dramaturgy is designed to facilitate flexible handling of the learning journals posts, as well as to quantitatively (not qualitatively) decrease the learners’ required efforts.

The second lecture initiates the first post: The learners should be introduced to the weblog technology in a hands-on seminar to keep those learners who are less skilled at technology engaged in the course. In addition, the learners should be informed about weblog etiquette and equipped with the URLs of the recent courses. Subsequently, the learners should be provided with frequent (fading) reminders, such as vlog “learning waves,” via feedback during lectures or personalized advices via weblog comments. Students are not forced to generate qualitative best posts, but are coached to keep the three dimensions – content, networking, and technology (weighted according to the 5-point schema (Du and Wagner 2005)) – in mind.

Essentially, we successfully integrated this method into academic courses and provide evidence of this method’s positive impact on individual learning processes. However, we also discovered that the realizing of the networking dimension, especially the interaction and discussion between the students, differed during the various semesters and seems to depend on each learner’s motivation. A major problem was that students often only posted on the publication deadline, which meant that other students did not have the opportunity
to comment on this post or compare it with their own impressions. During the current semester (2008), we have found that the introduction of a feed reader or RSS reader (Heidecke 2008) positively affects the students’ interaction. Hence, they are less tied to the publication deadlines and they are pushed by the information that somebody has interacted (commented or posted) on someone else’s blog. This has led to an immensely improved cross linkage. Recognizing the benefits (e.g., problem solving within a few hours) of this interaction, the students are increasingly committed to write their blogs posts.

5. Conclusion and related work

This paper describes a method with which to design a learning environment using learning journals to enforce increased individual learning. More specifically, the paper reveals that learning journals enable the achievement of level three (transfer to and application in the working environment) of Kirkpatrick’s four-level model that was generated to evaluate learning programs (Kirkpatrick 1994). Some authors maintain that attaining the third level is proof of a professional learning program’s effectiveness.

The characteristic of this learning environment comprises several factors: First, the course consists of several presence modules arranged over a period of time. Furthermore, the learners act within a restricted scope in terms of a learning content, as well as the number of involved learners. Analogous to a community, the learners are divided into a fixed group with common goals and assigned to a special topic for a restricted period of time. Hence, under these specific restrictions, the transferability to professional trainings is possible.

In further research, interviews with experts will demonstrate how to successfully align this method with professional trainings. In addition, the empirical foundation should be analyzed in more detail to determine precisely how different course dramaturgies affect learner motivations and the individual learning curve. Furthermore, the method should be illustrated and extended, providing information on the roles, issues, documents, etc.

References
The eLIDA CAMEL Nomadic Model of Collaborative Partnership for a Community of Practice in Design for Learning

Jill Jameson
University of Greenwich, London, UK
j.jameson@gre.ac.uk

Abstract: A nomadic collaborative partnership model for a community of practice (CoP) in Design for Learning (D4L) can facilitate successful innovation and continuing appraisals of effective professional practice, stimulated by a ‘critical friend’ assigned to the project. This paper reports on e-learning case studies collected by the UK JISC eLIDA CAMEL Design for Learning project, which implemented and evaluated learning design (LD) tools in higher and further education as part of the 2006-07 JISC Design for Learning pedagogic e-learning programme. Project partners carried out user evaluations on innovative tools with a learning design function, collecting D4L case studies and LD sequences in post-16/HE contexts using LAMS and Moodle. The project brought together learning activity sequences from post-16/HE partners into a collaborative e-learning community of professional practice based on the CAMEL (Collaborative Approaches to the Management of e-Learning) model, contributing to international D4L developments. This paper briefly provides an overview of key project output contributions to e-learning innovations, including results from teacher and student evaluations using online surveys. The paper explores intentionality in the development of a community of practice in design for learning, reporting on trials of learning design and social software that bridged some of the tensions between formalised intra-institutional e-learning relationships and inter-institutional project team dynamic D4L practitioner development. Following a brief report of practitioner D4L e-learning case studies and student feedback, the catalytic role of the ‘critical friend’ is highlighted and recommended as a key ingredient in the successful development of a nomadic model of communities of practice in the management of professional e-learning projects. eLIDA CAMEL Partners included the Association of Learning Technology (ALT), JISC infoNet, three universities and five FE/Sixth Form Colleges. Results reported to the UK JISC Experts’ Pedagogy Group demonstrated e-learning innovations by practitioners in D4L case studies, illuminated by the role of the ‘critical friend’. Professor Mark Stiles of Staffordshire University. The project also benefited from case study evaluations by Dr Liz Masterman of Oxford University Learning Technologies Group and the leading work of ALT and JISC infoNet in the development of the CAMEL model.

Keywords: e-learning, communities of practice, collaboration, design for learning, JISC, case study

1. Background

This paper gives an overview of selected findings of the UK eLIDA CAMEL design for learning project funded by the JISC (Joint Information Systems Committee) during 2006-07. The article provides an overview of the project case studies, reports briefly on practitioner and student feedback, and reflects on the role of the ‘critical friend’. With a focus on e-learning Independent Design Activities (eLIDA) for Collaborative Approaches to the Management of e-learning (CAMEL), the project used LAMS (Learning Activity Management System) learning design software for the creation of learning activity sequences and Moodle course management system for project team and selected classroom interactions. The project developed from two prior funded studies organised and delivered during 2005-06: the JISC-funded eLISA (e-Learning Management System) learning design software for the creation of learning activity sequences and Moodle course management system for project team and selected classroom interactions. The project developed from two prior funded studies organised and delivered during 2005-06: the JISC-funded eLISA (e-Learning Independent Study Award) led by the University of Greenwich with the University of Oxford and selected further education partners, and the HEFCE-funded CAMEL project led by JISC infoNet and the Association for Learning Technology (ALT).

In December, 2007, the eLIDA CAMEL successfully completed its design for learning work, collecting fourteen comprehensive individual design for learning case studies, seven collaborative case studies, 101 student feedback responses and a collection of data comprising e-learning sequences, surveys, reports, photographs and video clips from team members on the implementation and evaluation of tools and systems to support design for learning in a range of post-16/HE contexts. Activity sequences and processes were tested by practitioners in five different institutions and brought together into a ‘CAMEL’ collaborative e-learning community organised with JISC infoNet and ALT, to reflect on, synthesise and disseminate developments in D4L within a community of practice.

The project trialled D4L sequences with practitioners in London, South East England, Leeds and Loughborough post-16 institutions using LAMS V1.1, V2, Moodle and, in limited ways, a brief consideration of RELOAD. The project built a community of practice for critical evaluation of and feedback on practitioner use of D4L software and pedagogical practice and was structured into the following components: (1) Pedagogic: the ‘eLIDA’ aspect focused on design for learning pedagogic evaluation, including the development, implementation, monitoring and evaluation of DIL activities by practitioners in post-16/HE; and (2) Social: the ‘CAMEL’ aspect focused on collaborative social face-to-face and on-line e-learning community
activities. These included the development, implementation, monitoring and evaluation of practitioner’s use of design for learning in collaborative activities using the CAMEL JISC infoNet community of practice model.

The pedagogic and social aspects of the project were delineated as complementary strands. The project was planned with the understanding that designing an intentional community of practice in e-learning for a project team from selected institutions and agencies was likely to be both a challenging and illuminative process. It was envisaged that the progressive bringing together of such a community might result in new understandings and models about the ways in which practitioners use and learn from the application of e-learning innovations in a CoP.

1.1 Growing the CAMEL community of practice model from Uruguayan agricultural practice

The eLIDA CAMEL implemented the CAMEL model (Ferrell and Kelly, 2006) of an intentional community of practice, with the aim of ‘growing’ this again in a new context, applying to it the pedagogic focus of practitioner design for learning. The CAMEL model had its origins in the ideas and e-learning work of Seb Schmoller of the Association for Learning Technology (ALT). It originated in the example provided by Seb from a 1985 visit to see his uncle’s Uruguayan farming self-help group. This group comprised eight members who met monthly, visiting each other’s farms to develop improvements in agricultural practice. The farmers developed their work together with the help of an expert facilitator. Meetings founded on honesty and trust were part of a stable, long-standing relationship between the partners in which agricultural farming practice visits were:

- Collaboratively planned
- Documented before and afterwards
- Focused on things which mattered
- Expertly facilitated
- Formally evaluated
- Strong in emphasising tacit knowledge
- Focused on making tacit ‘know how’ explicit (JISC infoNet, 2006).

An emphasis on practice-based authentic professional solutions, collaboration, good planning, critical friendship and honest dialogue derived from the original CAMEL project. This included the recognition that collaborative work in a community of practice is ‘… not just about good practice, it’s about practice, warts and all – and the warts are more interesting than the practice sometimes’ (JISC infoNet, 2006). This mélange of background influences from CAMEL was imported into the eLIDA CAMEL project, which was deliberately set up to include all main CAMEL institutional partners, to build further on the useful CoP structure and relationships that had begun to form.

In an earlier paper (Jameson, Ferrell, Kelly, Walker and Ryan, 2006) the authors noted the importance of distinguishing between intentional project-based communities of practice (Pór, 2004) and CoPs that emerge naturally as self-organising systems (Lave and Wenger, 1991, Wenger, 1998, Jameson, 2008). ‘Growing’ an effectively designed intentional community of practice requires commitment to a range of shared objectives, values and organisational processes such as those outlined above, or, predictably, the experiment is likely to fail.

Just as in good agricultural practices, working productively with people in educational settings requires the constant presence of beneficial elements such as secure processes, stable environments, nurturing feeds and natural elements such as sunlight, water and air. The eLIDA CAMEL project team emphasised several times that long-term relationships of trust, power-sharing and flexible approaches, based on concepts of garnering “tacit knowledge” (Polanyi 1958) are particularly important for creating an effective CoP, as observed by earlier researchers (McDermott 2001, Mason and Lefrere, 2003; Jameson et al., 2006). Both the “critical success factors for CoPs outlined by McDermott (2001) and “structuring characteristics” of CoPs described by Dubé, Bourhis and Jacob (2004) were therefore present, in variously adapted ways, in the model.

The development of professional practice is, in effect, best facilitated at a peer-to-peer level of exchange between practitioners in such an inter-institutional community of practice, rather than being artificially ‘managed’ in institutions by administrative controllers seeking to achieve performance improvements through external influence. The clash between managerialism and professionalism has been hotly debated for some years: researchers such as Randle and Brady (1997) critiqued ‘new managerialism’ in public sector
education, notably in further education, for placing emphasis on market values, efficiency and performance management above a more traditional public sector professional ethos. Clegg (1999) observed some years ago that the mechanism of ‘reflective practice’, ostensibly a benign method of enabling practitioners to reflect on their professional practice in self-empowering ways, in fact ‘produce[ed] a form of self-surveillance in which reflective practice becomes a managerialist orthodoxy’ (Clegg, 1999: 168).

However, others noted that to envisage professionals and managers as necessarily being at loggerheads with each other was somewhat simplistic, bearing in mind that many professionals are also managers (Exworthy and Halford 1998). Nevertheless, faced with numerous challenges in an increasingly sceptical public climate around the maintenance of professional standards and autonomy, public sector professionals have been gradually subjected to a redefinition of the very nature of professionalism so that, for example, the education profession has become increasingly less defined around autonomy and professional knowledge, and increasingly subjected to governmental control, accountability and instrumental effectiveness based on performativity (Patrick, Forde and McPhee 2003). The relative deprofessionalisation which has arguably ensued has been defined by some as ‘new professionalism’ (Evans 2008) or ‘re-professionalisation’ (Beck 2008) and remains increasingly subject to the targets set by governmental and institutional controllers. The collaborative work involved in public sector externally-funded inter-institutional development of communities of practice has therefore taken on a new urgency in terms of its importance for reinvigorating localised expressions of professional ethos, notably represented here in the form of teacher professionalism. Since communities of practice offer a self-organising, democratic way of engaging peer-to-peer debate with the facilitation of a ‘critical friend’, the model is particularly attuned to the development of a form of voluntarily proactive reflection on practice within relatively autonomous project teams rather than one that is externally surveilled and controlled by government or institutional management.

2. Method

As required by the JISC, May 2006 project plans outlined key project activities and work packages for an eighteen-month period in 2006-07. Activities undertaken by practitioners in the institutions involved were ‘showcased’ in a series of visits to each institution, using the nomadic model of CAMEL, in which a democratic ‘round robin’ of hosted visits takes place involving all partners. During and after each visit, data were collected about the e-learning pedagogic work of practitioners and the collaborative interactions taking place during visits. Feedback from project team and student respondents was collected in face-to-face meetings, within project wikis/forum spaces in Moodle and after each visit using surveymonkey.com online questionnaires.

2.1 Individual and collaborative case studies

Case study methodology and analysis employed techniques advocated by Yin (2002), including the collection of multiple sources of evidence. A series of rich individual case studies from partner institutions was gradually drawn up over several months. The ‘case’ analysed in individual studies was the holistic institutional pedagogic situation in which practitioners found themselves, including teachers, learners, institutional setting, learning technologies, mentor and mentees. The ‘case’ analysed in collaborative case studies comprised cross cutting partnership themes emerging spontaneously during CoP activities in CAMEL face to face visits. The collaborative case studies were supplemented by two observation reports provided by the Association for Learning Technology (ALT) and by reflective comment from the project’s ‘critical friend’. Professor Mark Stiles of Staffordshire University. Video recordings of reflections of eLIDA CAMEL team members were taken at the final project visit in Leeds in November 2007. All data were collected together and analysed by the project evaluator at Oxford University and project management team at Greenwich.

2.2 Learning technologies used in the project

Project learning tools, technologies and resources used by practitioners and learners included LAMS, Moodle and numerous tools provided via and within these learning environments. Project team members made use of chat, forums, quizzes, web pages, journals, presentations, labels and glossaries with their students as well as external resources. Participants noted in the project wiki that they had used worksheets, NLN objects, Flash, PowerPoint presentations, podcasts, video, word and PDF documents, hot potatoes quizzes, QUIA quizzes, interactive material from websites, Camtasia, Scorm activities, learning assets from JORUM, images and Quick Topic.
2.3 Communities of practice approach
Informal, social aspects of the project meetings were important and explicitly recognised as a necessary part of the work of building a CoP. Collaborative plans for meetings invariably built in a number of social elements, including an overnight stay in a local hotel, breaks for refreshments, and meals shared by the team in which there was no formal agenda apart from networking in a collegial, supportive way with colleagues. Project get-togethers were designed to encourage the team to relax and develop good long-standing working relationships.

3. Findings
The eLIDA CAMEL project produced seventeen design for learning sequences, fourteen comprehensive individual case studies from five different institutions and seven collaborative case studies to illustrate effective pedagogic uses of LAMS V1.1-V2, Moodle and related tools. Case studies included reflections on the re-use of learning designs and on sharing effective practice in D4L via a community of users. Limited uses of RELOAD were also considered. eLIDA team members collaborated in evaluating practitioner DIL pedagogic practices during project visits. Collaborative case studies emerged from data collected during and between visits. Feedback in surveymonkey on project activities was also received from 101 student respondents.

3.1 Feedback from learners
Online survey feedback from students was received in two batches of: (1) 77 responses and (2) 24 responses respectively from five different institutions. In general, learner survey responses to the use of design for learning online activities were very positive, though there was also some critical commentary from students at one of the higher-achieving institutions. Feedback from students was reported by partners during the visits. At the final visit, a round-up discussion of learners’ experiences was reported from Institution A, the leader of which said: “34 students were involved from 3 different classes, all studying ESOL [English as a Second or Other Language]; student opinions as collected from responses in surveymonkey.com indicated that 26/33 students had expressed enjoyment at using LAMS sequences; 32/33 said they would like to use LAMS again” (JISC infoNet 2007).

Figure 1: eLIDA CAMEL Partner Feedback from Visits

3.2 Feedback from project partners
Project partners gave written feedback in surveymonkey.com at the end of each visit, but detailed observation notes were also taken of all project meetings, recording live interactions between partners during face-to-face sessions. Observation minutes from the final visit recorded several items that partners had listed...
as strengths of the project. These included the time given for partners to build up strong foundations for supportive working relationships and to reconnect in early meeting stages to build trust and confidence. Partners reported that meeting times had worked well, while informal evening meals in relaxed externally situated gatherings fostered relationships, broke down barriers, built trust and forged connections in ways that fostered professional reflection.

Partner feedback throughout 33 individual survey grades given for visits over 18 months of the project duration indicated that these were regarded by participants as ‘excellent’ (61% overall, comprising: 6/8 for visit 4; 4/7 for visit 3; 6/9 for visit 2; 4/9 for visit 1); ‘good’ (36% overall, comprising: 2/8 for visit 4, 3/7 for visit 3; 3/9 for visit 2; 4/9 for visit 1); and ‘satisfactory’ (3% overall, comprising: 1/9 for visit 1 - respondent arrived late). No partner gave any grade below ‘satisfactory’. Figure 1 illustrates the 97% ratings of ‘excellent’ and ‘good’, with 3% (one person on the first visit) rating this as ‘satisfactory’.

Observation notes recorded that partners felt the project had successfully fulfilled many tasks that might not have been achieved by other methods. Participants said that although the list of tasks at the outset was “daunting to many partners”, they “felt less overwhelmed, due to the supportive element of the team and the team leaders” (JISC infoNet 2007). Team members also said that, “at the outset, having ten partners in one project seemed an unmanageable task but the CAMEL model helped it work”. They reported that the “collaborative nature of the project made it a real success, as the human face-to-face sociability element was vital”. Team members said “there was no competing, just a supportive environment”. Partners also reported that the number of project partners taking part was not too big to hinder relationship building and development or impact on the length of meetings, allowing time for updates on work done and objectives achieved in between meetings. Participants also commented that the team was “not too small: partners could gain valuable insight into other organisations, how they worked, and their successes and barriers during the project” (ibid).

Observed feedback from partners also recorded that they felt team leadership was very positive in “steering the project, following aims, meeting milestones and giving all partners a voice at each meeting”, while participants appreciated the “open” way in which they could contribute to meeting agendas and the encouragement towards friendly collaboration (JISC infoNet 2007). Time between meetings, usually 2-3 months, was viewed as sufficient to conduct tasks at their own institutions. Strong feelings were expressed about maintaining the integrity of the CAMEL model during the project. JISC infoNet reported that the resulting success was “directly attributable to the project remaining true to its philosophy”. Partners said that felt they were genuinely “telling their story” (ibid).

Participants also noted that: “the role of the critical friend role was very helpful. Meeting each other gave important insights into other organisations and opened doors. Each partner brought something valuable to the project table. The foundations were built at the outset and each partner had something they wanted to share, so they learnt many things from other organisations, small things, things that work, things that don’t work” (ibid). Overall, key areas of success were linked with the “designed features” of the CAMEL model, to what Dubé et al. (2004) refer to in their analysis of virtual communities of practice (VCoPs) as the overarching “structuring characteristics” of the CoP:

- Partners felt that the project was built with honesty and trust
- The success of ‘designed’ features were appreciated
- It was important to state at the outset the vital elements of the model
- There had been careful consideration of the size of project team
- Minimalism had been employed for tasks – the process was not that complicated
- The nomadic feature of the project was a real success
- The project’s success lay in the fact that it was “bottom-up not top-down”
- The celebratory nature of the project was an important element
- Total honesty about what worked and what did not work was important.

(JISC infoNet 2006)

At the conclusion of the project, partners wrote in the project wiki that they would miss the “building of bonds with members of the team” and the “encouragement and thanks extended to me and my team for all our work”. They said they would also miss “feeling our efforts are valued”, the “constant support and positive attitudes of partners” as well as the “enthusiasm for using technology to transform teaching and learning, which isn’t shared by some senior management within the institution”. They would also regret no longer
having the project’s “encouragement to succeed and drive innovation …the acknowledgement and praise of my team's work.” Pragmatically, one participant was worried about losing “the use of the partner’s servers” as well as “an independent voice which raises important questions”. A number of partners reported that “the use of the CAMEL model in this project has been invaluable”, while one practitioner said she “relied on support from the team when my mentees and I had problems” and she would miss this. Feedback recorded in the wiki was overwhelmingly positive.

4. Discussion

Although the practical application of the CAMEL model was highly rated by participants, this was not a predictable success and it was not easy or automatic to achieve. High expectations at the start of the project aroused concerns about the intricacy, level of difficulty and number of partners within the partnership. Despite this, the model seemed to work effectively as a result of the underpinning CoP elements deliberately designed into the CAMEL model (Inspire Research 2005, JISC infoNet 2006), which reinforce earlier findings cited above from prior researchers on CoPs regarding important underpinning “structuring characteristics”. One external agency member commented on both the risk potential and successful outcome achieved during the final visit, as reported in Figure 2 below:

![Figure 2: Quote from external agency W on the eLIDA CAMEL project](image)

The reasons why e-learning innovative team projects of this nature may or may not succeed are complex. In some ways the situation is analogous to those arising in agricultural experiments, which may thrive or fail, given their dependency on a variety of unpredictable environmental elements. Within the eLIDA CAMEL project, there was one partner who, facing considerable difficulty, was unable to complete all case studies. However, overall the broader mass of partners guarded against any real loss from that one difficulty. The quantum of success over failure within this project was therefore very high, and the failure within the team remained relatively invisible, in view of the high levels of contribution and success of all other main partners which masked one gap in the outputs. There is, however, no 100% guarantee of success for any project, as all are reliant on a range of complex interactive ‘live’ elements in educational situations that may fail or be withdrawn at any time. Nevertheless, this paper argues that it is possible to plan for greater levels of success in local situations by building in explicit structures and processes for CoP development in professional communities.

5. Intentionality in the development of communities of practice

Communities of practice as originally defined were voluntarily self-emerging entities (Wenger, 1998, Wenger and Snyder 2000), as noted above. However, many researchers now consider that CoP formation can be facilitated and that organisations should seek to achieve effective knowledge management within staff groups by enabling and supporting CoP growth and development in “managed” ways (APQC 2001; Dubé, Bourhis and Jacob 2004, Pór 2004). Furthermore, whereas traditionally CoPs were invariably defined as necessarily face-to-face, continuing thriving creation of and research into virtual CoPs is challenging this limitation. The jury is still out as to whether processes of “structuring spontaneity” (Brown and Duguid 2001, Dubé et al. 2004) in CoPs are ultimately effective longer-term. Pragmatic queries arise regarding what happens to “designed” CoPs when managing organisations depart or project funds are no longer available.

Yet, despite this, there is growing evidence of significant continuing success in applying the CAMEL model, albeit so far in project-bound time-limited ways in specific projects, linked with nurturing metaphors of education as a growing, creative process sharing many similarities with agricultural practice (JISC infoNet 2006).

The face-to-face and social software elements of the community engagement underpinning the work of the eLIDA CAMEL CoP seems to have fostered a creative, productive and trusting atmosphere for project participants. The project tended to offer more creative, flexible inter-institutional project team working than was normally available to participants in the formalised intra-institutional relationships that tended to be a
day-to-day feature of their working lives. The fact that this was not just a temporary “new project glamour effect” was borne out by continuing good feedback indicating that community engagement continued to strengthen steadily throughout the project. The “bottom up” nature of the eLIDA CAMEL was to some extent a potential challenge to institutional hierarchies, but since the work was both time-limited and externally held to account, no concerns were expressed about this. Ultimately, a feature of the strengths and weaknesses of these kinds of projects lies in the fact that they are time-bound.

6. The catalytic role of the critical friend

The engagement of a ‘critical friend’ for the project was a new feature developed by eLIDA CAMEL as a refinement of the original CAMEL model, in which the external evaluator was at first designated to play this role. However, an external agency member had commented in the evaluation of CAMEL that it was ineffective for an evaluator to achieve the ‘in-group’ trust and necessary balance between support and critique that was appropriate for the ‘critical friend’ to do this job effectively.

The ‘critical friend’ was deliberately not incorporated into the project until partners had settled down and developed their work and relationships with each other. Project management determined that this friendly expert should only come in at around the mid-point of the project, after participants had begun to see real work being developed. The project minute-taker recorded from initial meetings that “partners were keen to work together as they were all bringing something to the table to share. Increasingly, partners would discuss issues they encountered in their own institutions, whether positive or negative, during their feedback/update sessions. Discussions would often take the turn where partners had encountered a problem and other partners would offer advice/guidance. Partners also became increasingly complimentary of others work and achievements. This relationship further developed and strengthened over coming meetings helped by the informal activities, which play an important part of the CAMEL model.” (Comment by minute-taker in project wiki, Nov, 2007).

After this settling down phase, the critical friend began to be important in framing activities for the final two meetings. In the latter two visits, the ‘friend’ started to stimulate debate to engage participants to recognise that, although project work had so far been successful, it was unreflective: reasons for success were unclear, being based on tacit understandings rather than explicit reflection-based actions. Participants were, from this point, unanimous in expressing their interest in and support for the way that the ‘critical friend’ joined in from around the project mid-point and helped to take forward dialogue, reflections, observations and e-learning work. The ‘friend’ took project partners beyond their initial achievements, challenging them in engaging ways. He humorously and supportively brought in a new element of objective, critical and honest feedback that had them thinking in new ways. A practitioner and a member of an external agency commented on this (see Figures 3 and 4 below):

Figure 3: Quote from practitioner at partner Institution B

It was very important to have someone on the outside looking in. As we were all enthusiastic to use Moodle, it would have been too easy not to question its use and not look at the wider issues. The critical friend raised questions and got us to reflect upon what we were doing and, most importantly, why we were doing it.

Figure 4: Quote from partner at external agency Y

The role of the … ‘critical friend’ has proved invaluable. As part of the original CAMEL project it was expected that the external evaluators would play this part, but the combining of the roles did not work. The personality of the critical friend is crucial as the questioning and probing must be gentle, supportive and yet challenging without being threatening. They have to be a member of the project community for the required trust to develop - they cannot be seen as an enquiring outsider. These aspects could cause a problem for new projects following the CAMEL model.
for new projects, by bringing a 'critical friend' into all or most of the social aspects of earlier meetings, but not the work aspects. In this way, they could get to know and be trusted by the team prior to formal incorporation into the project at a point at which team members have begun to establish their work. To bring the 'friend' into project work earlier than around the mid-point might seem to be too early, but this point is worth exploring. Professor Stiles commented on the role of the "critical friend" (see Figure 4) noting the emphasis on what it was possible for project partners to learn from one another in ways that sustain and develop e-learning innovations:

A personal reflection on "The Critical Friend"

The experience has been thoroughly enjoyable. I have learned a lot, particularly about approaches to designing for learning from an FE perspective... I remain convinced that HE practitioners can learn much, especially about using technology in classroom situations, from their peers in FE. I think my role was much enhanced by having been part of the first CAMEL project as I suspect that unless the critical friend fully understands and embraces, the CAMEL "trousers down" ethos the role could be compromised. Also, I found being well known already to some of the partners made establishing rapport with the other, "new", partners far easier. The experience has added to my own research into issues around the sustainability of innovation in educational institutions, and has, in many ways, confirmed the importance of the organisational and professional cultural context and the impact that policy can have. I am delighted to be able to quote from some of the partners who have commented on the critical friend role in a way which makes me feel that my time has been very well spent and my efforts valued.

Figure 4: Reflection from the ‘critical friend’ to the project about his role

7. Conclusion

In recording and analysing the data collected in the eLIDA CAMEL project, it became clear that a community of practice had effectively developed using an intentional process to investigate design for learning. The project fulfilled its aim in acting as a 'seedbed' for design for learning innovations in the classroom aided by the complementary nature of the project's pedagogic and social strands. Practitioner D4L case studies and student feedback indicated that e-learning innovations using LAMS, Moodle and a range of other tools and processes had been effectively achieved, beyond the initial expectations of the project. Somewhat serendipitously, the many successes of the project were in part derived from the long-standing relationships of team members and the role of a number of key partners in quietly providing an infrastructure of friendly confidence and support.

Project partners and students rated the work of the eLIDA CAMEL highly and it is recommended that the CAMEL model should be applied in other contexts. The project team recommended that the added engagement of an expert 'critical friend' to work with the project team was important. Participants found that the work of the "critical friend" was highly positive in challenging and questioning people's achievements and incorporating proactive, honest and friendly critique. The inclusion of the 'critical friend' was a key ingredient in the successful development of a nomadic model of collaborative partnership for the development of communities of practice in design for learning. The project also found that it is critically important that the defining features of the CAMEL model are retained if the model is to continue to succeed. In an environment in which educators increasingly face challenges to their autonomy as professionals, a nomadic communities of practice model provides a refreshingly beneficial way of engaging teachers in peer-to-peer discussions as practitioners with a key focus on the development of understanding, leading to ongoing improvements in professional practice.

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Digital Literacies in the Lives of Undergraduate Students: Exploring Personal and Curricular Spheres of Practice

Sylvia Jones and Mary R. Lea
The Open University, Milton Keynes, U.K
s.v.jones@open.ac.uk
m.r.lea@open.ac.uk

Abstract: This paper reports on the initial findings from a project which offers a complementary perspective to much of the research on e-learning and student learning in a digital age. Rather than foregrounding technological applications and their associated affordances, its focus is on texts and practices and textual engagements in digital environments. Drawing on previous research into academic literacies (Lea & Street 1998; Lea & Stierer 2000; Lillis, 2001; Thesen & Van Pletzen 2006), it takes a textual lens to the experience of undergraduate students' learning in a digital age. The project contributes to our understanding of a changing environment in exploring the nature of literacies, learning and technologies and how these intersect in students' lives as learners.

The research has been carried out in three very different institutions of higher education in the UK, using qualitative, text-based methods. Forty-five undergraduates participated in the project and were interviewed on three occasions over a six month period. The interviews included discussions around their use of digital texts and technologies in their lives as students. In discussion with the research team, participants in the project accessed websites across a range of personal and curricular spheres, including social networking sites and resources directly or indirectly linked to their studies. They also showed examples of their work for assessment and guidance from tutors. This has provided a rich base from which to examine the nature of digital literacies for today's undergraduates and the implications of engagement in a range of texts and practices around technologies for learning.

Keywords: digital literacies; social networking; personal and curricular sphere, texts and technologies; learning

1. Introduction

In this article, we report upon some early findings from an Economic and Social Research Council, UK, funded project 'Digital Literacies in Higher Education'. Located at the intersection of literacies and e-learning, the research is an in depth study of students' digital literacy practices. It is examining the nature of literacies for today's undergraduates who, familiar with digital communication and online social networking, are also often engaging in e-learning as an integral part of their studies. Rather than just documenting students' reported uses of various technologies and applications, the research is focused upon the purposes and meanings students ascribe to their practices when generating texts as they go about their studies and communicate for social purposes. How, when and why they generate these texts, how they search, read and write and communicate using digital technology is enabling us to show that engagement with technology is not a neutral, individually motivated action. It is often closely associated with the requirements of the institution in which students study as well as being shaped by the wider social contexts of their lives.

The research has been set against the increasing utilisation of e-learning in higher education in many countries and the rapid growth in the use of digital technologies in communication, in particular, amongst a generation who have grown up with these technologies in their day to day lives. Indeed, today's university students are engaging with digital texts (texting, online chat, web browsing, social networking sites, blogging) in ways that may seem far removed from the more conventional literacy demands of university study. These changes are recognised by initiatives such as the U.K. Higher Education Funding Council for England's 2005 E-learning Strategy which has set out a 10-year strategy to integrate e-learning into higher education with the intention to transform the learning experiences of students. In addition, considerable investment in e-learning is being driven by governmental funding bodies. This project contributes to our understanding of this changing environment in exploring the nature of literacies, learning and technologies and how these intersect in students' lives as learners, across and at the boundaries of the formal HE curriculum.

2. Literacies, learning and technologies

The project is building on an established field of enquiry offered by academic literacies research, which has been concerned with literacies and learning in higher and further education (Lea & Street 1998; Lea & Stierer 2000; Ivančić 1998; Lillis 2001; Walton & Archer 2004; Ivančić 2005; Thesen 2006). This has provided evidence for the ways in which literacy practices, reading and writing texts, are contextualized social and cultural practices and central to the process of learning in the academy. This contrasts with a description of literacy as a decontextualised cognitive skill. Although originally concerned with more conventional contexts...
of student writing and tutor feedback on assessed work, recently researchers in the field have begun turning their attention to online and e-learning environments. This has resulted in examination of, for example, the relationship between the texts of students’ online conference discussion and their written assignments (Lea 2000; 2001; Goodfellow et al 2004), argumentation in online learning (Coffin & Hewings 2005), meaning making through the use of hypertext (Mc Kenna 2006), power, authority and institutional practice in online message postings (Goodfellow 2005; Lea, 2007). These studies provide evidence for the relationship between writing, reading and meaning making in the process of knowledge construction in digitally mediated environments. However, whereas this prior research has focused specifically on digital practices within the university curriculum, the present project is developing these principles further in exploring a range of practices both within and at the boundaries of defined curriculum spaces for learning and assessment.

In focusing on hybridity and fluidity in digital texts, the project is building on a research tradition which foregrounds issues of meaning making in text production, and in particular how meanings are negotiated and contested through engagement with a range of literacy practices. It is exploring the practices of writing and reading and the production and negotiation of digital texts that are involved in the day to day business of being a student, both in the curricular and personal sphere and, therefore, will add further to developing methodological principles for exploring the relationship between literacies, learning and technologies.

Research on literacies as social practice in higher education takes its theoretical and methodological framing from the New Literacy Studies (Barton 1994; Street 1984). This body of work argues that reading and writing texts is concerned with issues of meaning making in specific social and cultural contexts and that this has particular significance for understanding issues of learning in educational settings. It draws on methodological and theoretical principles, which are informed primarily by applied critical linguistics and social anthropology, in examining the nature of different participants’ expectations, interpretations and understanding in any textual encounter. In order to empirically access these, researchers use a mix of research methods, most frequently qualitative, which include interviews with participants about their writing and reading practices in context and textual analysis of the texts being discussed. The use of the term ‘literacies’ in the plural signals a view of literacy as engagement in a range of different social practices around texts, depending on the specific context, rather than just individual cognitive activity. The literacies of new literacy studies foregrounds the relationship between written texts and learning from the perspectives of the different participants involved, and in so doing pays particular attention to the broader institutional context of text production.

We suggest that this focus on literacies is particularly generative in debates around learning and technologies for the following reasons.

- It offers a robust theoretical and methodological frame which has already made a significant contribution to understanding learning in a range of educational contexts.
- It foregrounds issues of meaning making in textual production in learning environments. This is particularly significant since so much of students’ digital engagement involves the reading and writing of texts; both their own and those of others.
- It provides the framing for asking critical questions about learning and technologies both in and outside the formal curriculum, and where these obviously overlap, since its focus is on detailed textual encounters and their particular significance for those involved. This contrasts with approaches which are concerned with students’ use of technological applications, with little attention to the texts and practices associated with their use or the contexts in which meanings are made.
- It foregrounds the importance of the institutional context and the part that universities and colleges play in reinforcing historically significant ways of making meaning in a digital age.

The literacies perspective offered in this paper also complements research in the field of e-learning, which generally takes the technologies as its starting point (Conole et al 2006). Although there have been some attempts to take a more theorized approach to research in this field (Conole & Oliver 2007), these pay little attention to textual practices in the construction of knowledge in digital environments. However, Crook (2005) argues that there is a need for more research at the intersection of academic literacies and technologies, in particular with respect to reading texts within the broader contexts of institutional, technical and interpersonal practice. Our research has responded to this call in taking a textual, rather than technological, lens to digital practices and considering how meanings are produced, negotiated and contested. Texts produced in association with digital technologies are hybrid, fluid and multimodal and offer innovative spaces for the integration of a range of texts in different modes. Our research is illuminating students’ practices of reading
and writing multiple and hybrid texts across a range of contexts. Axiomatic is a recognition of the central nature of texts, both in the construction of knowledge and the practice of learning, which is largely absent from e-learning research to date. (For fuller discussion see Goodfellow & Lea 2007).

3. Research methods

Our research methods have been framed against the background of a lack of fine-grained, ethnographic-style (Green & Bloome 1997) research of literacies, learning and technologies in higher education. In order to address the diverse contexts of higher education, the research was carried out in three very different kinds of institutions offering tertiary level provision in the UK. These were: a post 1992 university (post-1992 universities were formerly polytechnics given university status in 1992); a further education (FE) college, offering foundation degree courses in addition to vocational certificates and diplomas; an established traditional university, offering primarily academic subjects at undergraduate and post-graduate level. By selecting participants from these three contrasting institutions, the study was attempting to go some way towards representing the broad spectrum of students in higher education in our research findings. This meant that our participants had very different experiences of being a student. They were engaged in different kinds of course offerings, from vocational courses with a fairly rigidly prescribed and delivered content, to - at the other extreme - conventional academic disciplines.

Forty-five undergraduates were recruited to the research, studying across a range of subject areas including academic (single subject and interdisciplinary courses), professional and vocational contexts. We interviewed each participant three or four times at their institutions over a six month period. These interviews were normally carried out in small groups of three or four but some students were interviewed individually. In addition to these interviews we carried out a process of ‘shadowing’ by keeping in close contact via short email exchanges, chat and text messages. We also observed students during their interviews using a range of texts and technologies both specifically for their university work and in their lives more broadly. Our intention was to build up a picture of students’ literacy practices as they read and write, produced and negotiated digital texts, in different contexts and across modes. In addition, we also collected hard copy and electronic examples of a range of students’ texts both within and outside the curriculum. A rich data-base was therefore assembled, consisting of interview transcripts, electronic field notes reflecting on observation of practices, texts from social networking sites, curriculum sources, personal development plans (PDP), evidence of student engagement with a variety of digital texts and practices, written, visual, multi-modal and web-based.

This process has enabled us to gather rich descriptions of the contexts in which text production occurs. Interviewing students repeatedly over a six month period meant that we spent some considerable time in the three institutions with the result that we were able to observe and interact with participants in the contexts in which they spent much of their life as students. We observed them as they interacted with tutors and moved around the building. We also had opportunities to talk to their tutors1 who discussed with us aspects of their course and teaching approaches and sometimes made available related paper and digital course material. These discussions with tutors informed us of teacher expectations around uses of electronic and other resources and the kinds of texts students were expected to produce. This helped us to understand more about the attitudes and practices that constituted the different cultures of the institutions, enabling us to make some comparisons between the different contexts. In our ongoing contact with the students we were able to uncover descriptions of the personal not just the institutional contexts of their textual engagement. Our data is not just concerned with students’ use of a particular form of digital communication or resource but how and why and for what purposes they were communicating in any particular context. We have also been able to observe the kinds of texts that students compose in contrasting contexts- in the curricular and personal spheres, both where these blur and overlap and where they remain discrete. This has enabled us to uncover instances where the personal practices of the participants do not always align comfortably with institutionally mandated practices. Our position as researchers, ‘outsiders’ in the institution, rather than being members of staff, has enabled these contrasts to emerge during discussions with our participants.

Whilst being an ‘outsider’ may have resulted in important issues being made visible that may not have done so if we were members of the teaching staff, being an outside researcher has also resulted in limitations in our data collection. Paramount amongst these has been our access to students. Without an obvious institutional base, maintaining contact with students was sometimes difficult, despite all the different forms of communication available, and finding suitable venues for interviews depended on the good will of individual

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1 In this paper, we use the word ‘tutor’ in its UK sense to refer to any academic member of staff taking a teaching role.
members of staff in the institutions concerned. In addition many students worked part-time and did not spend much time over and above the formal teaching time at the institution.

4. Some initial findings

In this section of the paper, we introduce some of our initial findings about digital literacies. We describe the participants’ engagement with digital texts and discuss how these may provide insight into the factors that shape literacy practices. Participants in the study were found to interact with multiple and hybrid digital texts within and across both curricular and personal spheres. The digital environment in which the participants lived and studied included many forms of textual interaction, including texting, phoning, social networking, instant messaging and emailing, but not all participants took part in all of these. Evidence in the interviews reveals some of the contextual and cultural contexts that shape these textual choices and suggests that technology is only one of the factors implicated in the way our participants engaged in communicative practices.

In the interviews, when participants spoke about social networking and instant messaging it was often in the context of interacting with friends and family, in their personal sphere. Social networking ‘is to see what people are up to and how they have been doing’ (Anita); it is ‘not really for work’ (Douglas). Often participants mentioned engaging in these kinds of interactions at home ‘At home, I log on and chat to a friend on MSN, then go to Facebook and look at silly photos’ (Shaun). Some participants were convinced that everyone engaged in social networking or interacted constantly with Instant Messenger, ‘Everyone in class is on Facebook’, while other participants showed a reluctance to engage with these highly social forms of interactivity.

Interviewer What about John, do you use it?

John I have got a Bebo one, my friends all use it but I just, I can’t be bothered to just sit there and type to every friend saying hello and then a week later get a reply saying oh yeah how are you doing and then

Interviewer Is that because some of your friends are sort of mostly in [name of a town] or locally

John I think it is the other way round because my friends have all sort of split up now and people have gone everywhere if I start a conversation with one person it will just go on and on and on and I will learn about everything they have been doing and then I will talk to another one and I will be online for about 2 days

Among those participants who embraced social networking, it became clear that they were engaged in multifaceted kinds of interactivity in which they took on different roles and constructed identities within the textual space of the interaction. The positioning that took place in the interactions enabled them to cultivate friendship and camaraderie whilst also doing work for university assignments. The extract below is an instance of this and shows intertwined identities at play. It is part of a longer interaction from a participant, Lisa’s, Facebook page and the fragment reproduced below lasted from 5.27pm to 5.36pm. For the purposes of maintaining anonymity, we have summarised some of the contributions. It begins with a friend sending a message saying that she is about to start work on a new assignment. Lisa’s response to her friend begins with the well known text messaging acronym lol (laugh out loud) transformed into capitals with the extra letter LOOL to signify her own strong feelings about doing the assignment.

LOOL oh, you’ll regret starting it, trust me I do…loooool.
I have to go and see Peter on Wednesday about this s..t Assignment….I really need help….arghhhh
How come you’ve left it till now? (Lisa)

Lisa’s friend responds by writing that she has procrastinated after finishing a previous essay and has been preoccupied with other things. Using very colloquial language, she expresses concern about the amount of work she has yet to do, then says she has to see the same tutor, Peter, on the same day of the week as Lisa. Lisa replies

LOOL … well done on finishing the MFP essay… I need to do some amendments to cut it down on word….I need to do some amendments to cut it down…proof read lol…revision piz dnt even mention that word Marketing…Hate that subject with so much passion…I don’t get it…I’m going to fail this exam…I swear on Monday, after the exam, I’m going straight to Adam’s room and I’m not moving till I get every single little thing about this assignment…he might as well do it for me….loooool
Good luck with everything

Another friend, who has been following this conversation, sends a message

Girls: if you read the module outline it’s fairly simple…
She then continues by explaining how to go about doing the assignment.

We suggest that the participants position themselves in this interaction in several ways: as a supportive fellow student; as a student in need of help; as a friend; as a voice momentarily taking on the role of teacher or older, wiser friend. The use of colloquial language, plus acronyms from texting language, constructs a camaraderie and openness between the interactants. This is further consolidated by being disrespectful about the course and tutors. Lisa positions herself as a worried and somewhat hopeless student, and this seems to engender help from another student. In this final contribution, the new contributor positions herself as confident bearer of knowledge. However, the humour is obvious when this contributor takes up a role as ‘teacher’ and positions the other participants as ‘pupils’ in the exchange by the use of the word ‘Girls’. This seems to be a ploy that prevents the final contributor in the extract from being regarded as a ‘know all’ and hence she can be part of the friendship group and still pass on useful information. The positioning therefore constructs supportive friendship for the participants around the shared experience of studying the same course. The engagement is hence very much in the personal sphere, though their shared bond is the university course, the curricular sphere. There may be some evidence here of an intertwining of curricular and personal spheres, which we discuss in more detail below.

More evidence of the kinds of contextual and cultural factors that may shape textual interactions in the digital environment is supplied by the practices of participants contacting family and friends at home. Issues of identity and affiliation may also be at play in shaping the practices of these participants in this highly personal sphere. The extracts are from an interview with participants who all have family in Europe. Each of these students uses different applications to contact her family. One participant finds it easier to interact with her family by using an application that does not rely on written text but enables her to see and hear her family in highly interactive oral and visual modes.

In this country sometimes but more is back home, I come from [name of country], I do use video all the time. I don’t like reading, writing, I prefer talking and seeing. (Gillian)

Another participant, Margaret, told us that her family circumstance is such that if she is unable to telephone her mother, her mother uses her brother’s Instant Messenger. Margaret explained how she prefers to do college work, in the curricular sphere, with her Instant Messenger turned on all the time so she and her mother spend a lot of time sending short messages to each other, in the personal sphere. When in contact with her mother and brother, she engages in sessions of intermittent contact that result in interactive texts that have a lot of immediacy.

Even if I’m writing an essay I always have it [Instant Messenger] on, because if I don’t talk [by phone] to my mother, and my mother uses my brother’s MSN so that’s the way because we talk to each other daily, me and my mother, so either we have MSN or by phone. [Margaret]

In the same conversation, Alice describes her way of communicating with her family. She engages in an entirely different textual practice, shaped partly by her own preference and also by the fact that ‘usually people are busy, they are doing something else’. She contacts them only once a week and writes long email texts rather than short highly interactive ones.

I don’t use MSN… I prefer writing e-mails, cos using this MSN because usually people are busy, they are doing something else, so it’s not like having a proper conversation, …I prefer spending ½ an hour and writing a really long e-mail, saying everything what happened in the past week or so, rather than spending 3 hours just gossiping and chatting. (Alice)

Unlike Margaret, in this instance Alice seems to be keeping the personal and curricular spheres of practice separate from one another. In addition, there are indications that these three participants are positioning themselves in relation to particular textual practices.

Issues of identity and affiliation also seem to influence the engagement and shape the practices of a first year student in her use of email. Like almost all of our participants, this student had her own personal email provider as well as access to a university email account. She spoke enthusiastically about this provider, which is a non-commercial company based in her home town.

Well I’ve got that one because it’s my personal email account and that is really really good, actually I’ll sign into it and show you. So I’ve got that from my personal stuff and it’s my favourite email account because it’s got lots of features that I’m very fond of and it’s where I get all my friends email me there and my family and me and my granddad have got quite a good email contact going on and things like that and then I’ve got my university account and that’s completely separate. That’s just university things (Carol)
It emerged from the interview that ‘all my friends’ were in fact largely her friends from her home town. By using this personal email provider, she seems to be maintaining an allegiance to that group and makes a big distinction between her own provider and the university email system when she says of her university account ‘That’s just for university thing’. This student seems to be shaping her practices around affiliation to email providers in either the personal sphere (her home) or the curricular sphere (the university).

Other participants also appear to make discriminations based on similar notions of affiliation. These participants seem to prefer to use social networking and instant messaging for textual encounters with peers and email as different.

 if it is a person I know well you don’t need to be formal you just type it, if you see the person is online and available you just type the message there ….. I use email actually for most of the official communication I would think or for something I want to last. (Olive)

The highly interactive and ephemeral nature of Instant Messenger text is the way Olive chooses to engage with friends, but regards email text as more durable and more appropriate for other respondents. Other participants make a similar distinction. Lisa speaks of email as a more formal medium and specified her audience for this formal text as university tutors.

Formal would be something like contacting an organisation, e-mails to lecturers for example (Lisa)

Lesley uses email for university administrative affairs only.

 we’ve got university web mail and that’s my only email account, I don’t have one of my own… I don’t really need one ‘cos I don’t send emails as such for personal use generally, most of my emails are to with erm, placement related things, (Lesley)

So far, we have explored engagement with digital texts in the personal sphere and in contexts where students discriminate between personal and university contexts, between curricular and personal spheres. We suggest that many contextual issues pertaining to the participants’ sense of identity and feelings of affiliation may shape their digital texts, for example, a tendency to separate personal textual interactions from those within the curricular sphere.

Within the curricular sphere, participants produced a range of texts using different applications to get the job of studying done. Barbara sends PDF files to her husband for them to be printed at his office; Margaret uses her email to store all her assignments and to transport her assignments from university to home. Some participants are required to use email to submit their essays for assessment. Perhaps a more significant digital interaction within the curricular sphere is that carried out using email between tutor and students. There are accounts by participants of interactions between tutors and students outside of face to face lectures that are constructed by email text. These are sometimes prompted by the tutor, as in the extract below, where students attending a lecture are invited by the tutor to email him and to ask questions about specific slides in his power point lecture.

 So he’s got some sort of reference if you email him and say on slide 44 what did you mean by that. So it’s more for asking questions and getting more out of it really (Carol)

Email text is sometimes part of a lengthier interaction

 We have assignment questions then you can ask him through email or after the lecture and then sometimes he pose some questions and answers that people usually get asked on the web and we just go in and have a look (Yvonne)

In this case, the email interaction is an element in a series of textual interactions which include the institutional Virtual Learning Environment (VLE). The frequency that participants mentioned emailing tutors in the interviews suggests that this is becoming an established institutional practice in which the curricular sphere is extended digitally beyond the lecture space.

In these instances of emailing tutors described so far, the impetus to use email within the curricular sphere seems to come from the students themselves. In other interviews, the impetus, or even mandate to write email texts seems to come from the institution. One example of this is when the email text becomes part of the institutional assessment system. Students out on placement are required to develop plans for managing clients and then they are required to email the plan to their tutor, using the email at the Centre where they are working. The management plan is used for assessment, though the actual supervision is carried out by a clinical supervisor based at the Centre.

 basically what would happen is we’d have a session that we’d have planned, the management for that client, which we email to the UCL tutor. But our clinical supervisor then does the session, talks about the session afterwards and then talks about just the general progress on the placement (Barbara)
Whether this form of textual interaction is initiated by the student or by the institution, there seemed to be a preference among some participants to carry out this communication using their personal email provider and not to use the university system. The extract below recounts an episode when students’ reluctance to access the university email system led to the institution directing messages to students’ personal emails.

*They do forward it to e-mail [personal email] as well most of the time, because we had, I think in our first year, we had . . . or maybe within my foundation we had a problem that some people don’t check Blackboard so then they decided to put it on Blackboard and also send it to our own emails.* (Rosemary)

The preference for personal email is also apparent in the following extract, in which the participant expresses frustration at not receiving a personal email about some room changes.

*We are not checking Blackboard [the institutional Virtual Learning Environment] on a daily basis but we are probably checking email [personal] on a daily basis.* (Catherine)

Participants from another of the universities in the study are not offered a choice apparently the staff here are told they’re not allowed to email people’s private email, like a Hotmail account, it has to be the [institutional] one (Barbara)

In this case, therefore, the institution has imposed a clear demarcation between institutional (curricular) and personal spheres. However, in the two other universities in the study, our participants, and by implication, other students, habitually used their own accounts. One third year participant we interviewed was unsure whether she had a university account, even though she frequently emailed the university. The preference shown by many of our participants to use their own email accounts may indicate that issues of identity and affiliation are operating in these choices, with participants showing some reluctance to change their practices around emailing and engage fully in the curricular sphere.

A further example of these different spheres of activity and textual practice is evident in some participants’ discussions around group work. We found that collaboration, in which students are required to work together to produce an assessed piece of work, for example, a report or power-point presentation, was a frequent activity amongst the participants in our research. Taking part in group work requires students to use digital texts for the purposes of collaboration and to produce written products for assessment that meet institutionally stipulated criteria.

In most of the interviews in which participants talk about group work, the choice of technology to contact other students seems to be left to the participants. Some said they used ‘whatever worked’ including text messages and telephone calls. In one example, two participants collaborated using Instant Messenger because this was their usual way of interacting digitally. Below is an extract from their negotiation in Instant Messenger about a group project on leisure activities.

*I can’t think of anything interesting in these two sectors…maybe some park…? park??...erm i was thinking something like I dunno a library or a museum I dunno…that’ all I can think of to be honest…but the truth is we need to figure something out* (Rosemary)

The colloquial nature of this exchange is very noticeable and exhibits similar features to the Facebook text discussed earlier. In another example, the choice is to use email because it is easier to use attachments

*Or you’re more likely to use an attachment to do that
Cos it’s difficult to do that in Facebook.* (Kathleen)

When completing group work, participants have to engage with a range of literacy practices. Their communication can be as informal as the Instant Messenger communication suggests, but the group reports they produce have to comply with institutional and disciplinary conventions, engaging in a range of practices common to the production of academic texts. Participants described their textual activities as drafting, critiquing, developing further text, inserting diagrams and doing research.

*we just kept passing documents backwards and forwards, backwards and forwards...Different people were responsible for different parts so they were kind of cutting and pasting their bits into it, and then it was coming back to me and I was kind of tailoring it down then it was going back again.* (Catherine)

*my friends wrote some pieces of information printed out from the internet with some graphs and tables...while writing a group report we referenced it, so there is like the whole piece of the report referenced, so there are links to websites* (Rosemary)

*Yes, Josie was drawing these [diagrams] by ‘hand’ [into Word], I couldn’t do them, and she was cutting and pasting.* (Catherine)
Two groups of participants expressed a strong preference for using their personal email accounts in their textual interactions while doing group work. This was despite the fact that these groups had been instructed to conduct their collaboration using the module VLE discussion forum. In the interviews, the participants told us that they developed practices that undermined this request, as they much preferred to interact via their personal emails.

we were just putting notes there [on the VLE discussion board] just to show that we are doing something as a group, but actually we didn't place any discussions there. (Alice)

we were doing more by e-mail because we didn't actually want the tutors to see what we were talking about, and in a way we were protecting one another as well, we didn't want the group to be exposed. (Catherine)

As in the examples of practices around email and the use of social networking sites, explored above, we suggest that issues of student identity and affiliation are implicated, in this instance in students’ reluctance to use the institutionally sanctioned discussion boards within the university’s VLE.

5. Conclusion

This paper provides some initial explorations into understanding students’ digital literacy practices, offering a complementary perspective to the technological focus which has tended to dominate e-learning research to date. We are attempting to unpack what kinds of things students do with texts and technologies, both in and outside the curriculum and in those spheres where the personal and the curricula overlap. Early findings are suggesting that the intermingling of institutional and academic textual requirements and issues of student identity and personal affiliation come together to shape the textual interactions of students and their engagement in digital literacies. Evidence suggests that students actively discriminate between different contexts for writing and create conscious demarcations between personal and curricular spheres of activity and practice.

At present, universities worldwide are investing heavily in a new generation of technologies, social networking tools and the affordances offered by Web 2.0 technologies, aiming to mimic those used in students’ wider worlds and bring these more centrally into institutional approaches to supporting teaching and learning. This appears to be based on an assumption that, because students are already operating successfully across digital contexts outside the curriculum - a perspective which the data from our project supports - universities will benefit from harnessing this expertise and aligning it more closely with the formal context of university learning. The findings emerging from our research, such as those discussed above, would suggest that students may be somewhat resistant to such moves, often making their own decisions about the texts they produce, where and how, and showing a lack of willingness to blur the boundaries between the personal and curricular spheres in any meaningful way in their learning.

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Navigating the e-Learning Terrain: Aligning Technology, Pedagogy and Context

Mandia Mentis  
Massey University, Auckland, New Zealand  

m.mentis@massey.ac.nz

Abstract: Over the last ten years e-learning has rapidly emerged as a potentially effective mode of higher education, but it is still unclear what factors are important in the design of an effective e-learning course. e-Learning has been described as being a “disruptive technology” that changes how learning is approached in higher education (Garrison and Anderson 2003). The extensive changes in the technologies over the last decade have the potential to influence the way we engage with knowledge, but the potential will only be realised if we integrate this with an understanding of learning, and design the use of e-learning technologies accordingly within different contexts (Laurillard 2005). This paper explores the influence of the areas of technology, pedagogy and context on e-learning practice in higher education. Three vignettes relating to e-learning are presented which represent the shifts in technology and the tensions and influences of this on context and pedagogy. These vignettes provide the background context within which to discuss the design of an e-learning alignment guide (eLAG). This guide is a navigational tool, which offers e-learning designers a perspective on navigating the e-learning topography. It is devised to assist practitioners when navigating the changing and complex terrain of e-learning and teaching. The key finding of this paper is that technology, pedagogy and context need to be closely aligned in order to realise the potential of e-learning in higher education.

Keywords: e-learning, higher education, technology, pedagogy

1. Introduction

Privateer (1999:77) posits that "it makes little sense for academia to continue a tradition of learning significantly at odds with technologies that are currently altering how humans learn and interact with each other in new learning communities". A common theme explored in e-learning literature is the role that technology plays in changing the ways in which we learn (Prensky 2001; Siemens 2004). (Laurillard 2005a) posits that the extensive changes in the technologies available for learning over the last decade have the potential to change the way students engage with knowledge. She cautions, however, that the promises made for e-learning will only be realised if we begin with an understanding of how students learn, and design the use of learning technologies from this standpoint. These positions illustrate prominent arguments in the field of e-learning, which highlight the tensions that exist between a technology dominated approach or a pedagogy lead design of e-learning in higher education. This tension and pull between pedagogy and technology highlights the need to investigate the relationship between technology, pedagogy and context in a changing e-learning environment.

The development and growth of new information technologies over the past decade has led to substantial changes in e-learning. Often the best way to identify these changes is to examine the practice — what effect the changes have on the learner. The following three vignettes illustrate these changes via practical examples that serve to provide the background context for this paper. The vignettes provide three scenarios of learning within a postgraduate special education context — each illustrating a different reciprocal interaction between technology and pedagogical practice. This evolution through the three examples provides the backdrop for the development of an e-learning alignment guide outlined in the next section.

1.1 Vignette 1:

Samantha is a primary school teacher and lives with her two young children on a farm outside of town. She has taken a year off teaching to further her study in extramural postgraduate special education. She received her course handbook and readings in the mail and has read the required texts and journal articles set by the lecturer. After putting her children to bed she sits at her computer, downloads a journal article, finishes typing her essay and prints it out. She will courier her essay assignment to the lecturer tomorrow for marking and will start reading the journal article for her next assignment.

1.2 Vignette 2:

Paula is in her second year of teaching and doing part-time post-graduate online study to improve her skills in working with learners with diverse learning needs. Although she is traveling on her two-week holiday break from school, she has gone to an internet café to catch up on course-work and interact with classmates in her e-learning environment. She logs in to the class forum, reads the discussion thread that the lecturer is
facilitating on one of the set readings, types in her responses and poses some more questions. She reads two of the assignments already submitted online by other students and types in her formative feedback and peer rating of their work. She uploads her assignment for peer-evaluation and types in her reflections in her online journal. Two of the members of her study group are currently online so she logs in to the chat room for a synchronous discussion with them on their collaborative wiki assignment. She ends with a short note of congratulation to a fellow student on her wedding. She notes the time for the next virtual lecture with the lecturer and downloads the two prescribed readings to read on the beach during the rest of her holiday break.

1.3 Vignette 3:

Grant is a special needs teacher at a rural school who, despite his isolated workplace, stays connected with others in the field and continually updates his skills and knowledge via his personalized e-learning space. After the day’s teaching he logs on to his computer and reads the blogs of three practitioners from different parts of the world who are part of his community of practice. He adds his comments to their postings, and updates his own blog making links to their ideas and his professional practice. He reads the three new resources that have come directly to his home-page via his RSS feeds, and downloads a podcast of a lecture on autism to listen to on his iPod while traveling home. He then gets a video-Skype call from a colleague overseas with whom he is collaborating on a journal article and he opens their wiki space to discuss with him the changes he has made on their article. Before logging off for the day, he uploads to Flickr the photos from the school sports day to share with the school community.

The learners described in the three vignettes above are all engaging in e-learning. The difference between them lies in the kind of e-learning they are experiencing in terms of the context, technology and pedagogy that is being used. Each of the three scenarios reflect a different approach to e-learning: (1) scenario one describes the use of non-networked computers within a pedagogy that uses an information-transfer mode of instruction; (2) scenario two involves an interactive learning environment where class members co-construct meaning and interact online through networked computers; (3) scenario three describes a self-directed, connected, informal learning environment that is individualised, located within an authentic everyday work context and contributes to the wider learning community through the use of self authoring and social networking technology.

The three vignettes represent the shifts in technology and the interplay, tensions and influences of this on context and pedagogy in higher education, where: (1) Samantha is learning about special education using an e-learning environment that enables her to access information and complete assignments to send to her lecturer for evaluation (monological transmission mode); (2) Paula is learning to be a special education teacher using a closed, formal e-learning environment that facilitates online collaboration and co-construction of meaning through discussion with fellow students (dialogical interaction); and (3) Grant is learning as a special needs practitioner using an open, informal and personalised e-learning environment where he designs his own learning and contributes to the learning of others through self and joint publishing and networking within a global Community of Practice (multi-conversational networks).

As described in the three vignettes, there is a dynamic relationship between technology, pedagogy and context and all need consideration when engaging in designing e-learning environments. Given the rapidly changing e-learning terrain, this paper focuses on charting the shifts in technology and foregrounding the implications of these shifts for pedagogy within different contexts. An e-learning alignment guide (eLAG) outlines the signposts, landmarks and indicators in the three e-learning zones of technology, pedagogy and context, in order to show the changes that occur within them. This guide is a tool for alignment of these three e-learning zones. It offers e-learning designers and educators a perspective on navigating the e-learning topography and, as a navigational aid, provides some structure for traversing through the shifting and sometimes complex dimensions of e-learning in higher education.

2. The e-Learning alignment guide (eLAG)

The eLAG consists of three zones of the e-learning environment: technology, pedagogy and context, and within each zone, various layers, which impact on practice. The zones and layers have been mapped along a continuum from a more traditional, homogenous and formal orientation towards an emergent, diverse and informal orientation - in order to illustrate the trends, shifts and currents that have occurred within e-learning over time. The eLAG is conceptualised as a dynamic tool in that it can be used to plot alignment between and within zones when designing or reflecting on e-learning environments. It serves to analyse, discuss,
navigate or critique the ever-changing terrain of technology, pedagogy and context in e-learning environments.

2.1 The technology zone of the eLAG

It has been argued that technology itself is neither good nor bad and that it is the way that it is used that matters (Bates 2005; Nichols 2005). There are counter arguments that technology can never be neutral, and that particular technologies have specific affordances that might facilitate certain approaches and minimise others (Dron 2006; Feldstein & Masson 2006). For Bates (2005), a useful approach is to identify the kinds of learning that different media facilitate best, and under what conditions. The issue then, is whether we are using technology to do the same things, or taking advantage of the unique capabilities of the technology to do things differently (Oblinger and Hawkins 2006). McLuhan’s (1965) adage that ‘we create our tools, and then our tools create us’, highlights the reciprocal relationship between technology and its users. He suggests that there is always a dynamic interplay between the two and that this varies in different contexts and is continually changing. This is illustrated in Figure 1 below which presents the technology zone of the eLAG, which spans a continuum from what can be referred to as ‘traditional’ to ‘emergent’ in terms of both product (tools) and process (use) of e-learning. This continuum can be applied along a number of different layers including: tools and media literacies; computer hardware and software; affordances /design orientations; and e-learning approaches.

![Figure 1: The technology zone of the eLAG](image)

2.1.1 Tools & media

The evolution of technology used for teaching and learning can be traced back to the invention of the printing press in the fourteenth century and on to the introduction of the postal service and the telephone, both of which had an impact on distance education. It develops further in the twentieth century with the introduction of radio broadcasts in the 1920’s, film in the 1930’s and television in the 1950s, which again influenced, in varying degrees, the practice of teaching and learning. However, the rate of these technological changes was, as Bates (2005) points out, relatively sedate compared with the rapid acceleration of technology post 1980 with the introduction first of non-networked computer based learning, then networked computer use.
and subsequently advances which today include the world wide web, search engines such as Google, mobile phones, learning objects, wireless networks, and virtual reality learning sites (Bates 2005).

New technologies do not necessarily replace old technologies but rather they subtly change how and when we use them, as a broader range of choice becomes available to educators. This increasing choice ranges from reading print and books as more traditional forms of media on the left of the continuum to ‘reading’ movies and images and communicating via mobile phones, email, the web and social networking tools on the right of the continuum. For education to benefit from these shifts, skills in ‘transliteracy’ are needed. This involves shifting between, and communicating through, diverse media, including: books, oral narration and note-taking on the traditional end of the continuum and wikis, podcasting and uploading video clips to the web on the emergent end. The continuum of media literacy now extends from what is characterised as being linear, ordered, text based and physical to more networked, chaotic, web based and virtual approaches.

### 2.1.2 Computers/ Software – web 1.0 to web 2.0

The second level of the technology zone illustrates the evolution of computers and software on a continuum from the traditional non-networked or stand alone computers on the left through to web 1.0 networked systems and then the emergent Web 2.0 or social networking systems on the right hand side of the continuum. The use of non-networked computers for education involved independent learning using the computer for information downloads, drill and practice and word-processed documents. Networked computers saw the introduction of first Web 1.0, which allowed for interaction between users through the use of emails and then the development of Content Management Systems and Learning Management Systems (eg WebCT, Blackboard etc). Later developments saw the emergence of technologies known as Web 2.0 or social software which enable users to create information online as well as share this with others, engage in conversation and co-create knowledge. As Downes (2006) describes it, the shift from Web 1.0 to Web 2.0 technology has been a shift from the web being a medium in which information is transmitted and consumed, to an environment in which content is created, shared, remixed and passed along.

### 2.1.3 Design/affordances

The third level of the technology zone illustrates the shifts from traditional tools on the left side of the continuum which afford a drill and practice approach to teaching and learning, to emergent tools on the right of the continuum which support social networking and self directed learning. McLuhan’s (1965) maxim that ‘the medium is the message’ is useful when considering what different media afford. The continuum shifts from where the medium allows for the message to be one way (transmission mode teaching that is monological), to two way (interactive, dialogical teaching and learning) or multiple ways (networked, multi-conversational teaching). For example, print based learning is one-way communication as the message cannot be changed and moves from the author to the reader, or the teacher to the learner. This can be contrasted with individual postings to a discussion forum in a web based course where users interact with each other in two way communication between teacher and learner/s. Collaboration on a single document (for example a wiki), or hyperlinking within a blog, where potentially limitless anytime, anywhere users can respond, allows for multiple networked communication.

### 2.1.4 e-Learning

The fourth level of the technology zone illustrates how shifts in the previous levels of media and media literacy, hardware and software developments, and affordances of tools, impact on e-learning. Traditional non-networked computer learning is situated on the traditional of the continuum, and is mainly limited to downloading content, whereas moving along the continuum, with networked computers, possibilities emerge for whole courses to be put online through Content Management Systems which offer the potential for anytime-anywhere interaction and discussion between course participants. Within this approach, content and organization of learning is still very much teacher/institution controlled and managed. On the emergent end of the continuum, social software and Web 2.0 tools afford a learning environment where students can move from ‘information’ to ‘conversation’ to co-create content through the ‘read-write web’. The shift involves learners being instantly networked with others anywhere in the world through ‘publishing’ their writing as an author (via a blog), their photographs, or commentries (uploading photos to Flickr or videos to YouTube). The challenge here for educators is how to identify and maximise what is valuable in using these tools, and minimise what is not. While many educators acknowledge what the shift to e-learning 2.0 affords (Attwell 2007; Begg et al. 2007; Downes 2006; Murray 2007), there is still significant tension in formal learning contexts related to actualising these.
2.2 The pedagogy zone of the eLAG

While changes in technology have the potential to impact significantly on learning in terms of affording a more open and flexible learning environment, pedagogical practices are fairly resistant to change. In order to actualise the full potential of the technology, an aligned pedagogical approach is needed as outlined in Figure 2 below. The shifts in pedagogy show a movement from practices promoting homogeneity to more open systems where diversity is facilitated and learning is located within personalised authentic life-long and life-wide contexts.

Figure 2: The pedagogy zone of the eLAG

2.2.1 Learning theories

The first level of the pedagogy zone illustrates the progression of educational theory or models from the traditional, more homogenous approaches on the left of the continuum to the more emergent, open and diverse approaches on the right of the continuum. In terms of educational theory or models, a continuum can be traced in our understanding of what constitutes learning from instructionism to cognitivism and constructivism to what Siemens (2004) calls ‘connectivism’. This continuum is an adaptation of the work done by Conole et al (2004), and illustrates our conceptions of knowledge as being objective entities that need to be transferred to the learner by an ‘expert’ teacher on the one end, to a view that knowledge is subjective and mediated through interaction in contextualised settings at the other end. This view in turn has developed to approaches on the continuum where knowledge is seen as chaotic, complex and residing in ever-changing networks (Brown 2000; Downes 2006; Siemens 2004; Wenmoth 2006) that are co-created by individual learners through interaction with each other. As Laurillard (2005:13) puts it, “if you were to believe that teaching is about imparting knowledge, then the main requirement of the lecturer would be the possession of that knowledge. For some time, this has been the prevailing view of university teaching, and therefore academics are appointed on the basis of their qualifications in subject matter knowledge.” However if teaching is not just about imparting information and learning is not just about acquiring knowledge then what is it, how different is academic learning from everyday acquisition of information, and what are the implications of this for e-learning?
2.2.2 Teacher and learner
The second level of the pedagogy zone illustrates a range of teaching approaches on the continuum from a transmission model focusing on instructional training or the ‘sage on the stage’ approach, to the facilitation mode of ‘guide on the side’ or Feuerstein’s mediation approach (Mentis and Dunn-Bernstein 2007). Pedagogy has shifted in the digital age to more open conceptualisations of teachers as digital designers or what Siemens (2007) suggests is more of a ‘curator’ style approach which involves a combination of the ‘expert’ sage and the guide.

The role of the teacher as mentor (Mitchell 2007), guide, designer or curator of the learning experience aligns well with the changing role of the learner. This has shifted from the notion of a passive student engaged in downloading information to the self-directed learner who is comfortable with all the media and technologies of the digital age and an active and collaborative member of a community of learners. It has been suggested that today’s students learn differently and can easily feel disconnected from an education system that was designed for another time (Prensky 2001).

2.2.3 Content and assessment
Just as the role of the teacher and learner shifts to accommodate new approaches in the digital age, so too does content or subject matter and assessment processes. The rapid growth of knowledge is a relevant factor impacting on decisions about what content to include in curriculum. According to Gonzalez (cited in Siemens, 2004) half of what is known today was not known 10 years ago, and the amount of knowledge in the world has doubled in the past 10 years and is doubling every 18 months. What constitutes relevant, up to date content for any discipline or course then becomes debatable, and as Siemens (2007) suggests, content becomes more a conduit for conversation or interaction than an end in itself. The move from more homogenous to diverse pedagogies raises questions around the separation between formal and informal learning. Recognition of different form of knowledge and skills gained outside of school or formal training institutions (Green et al. 2005) align well with a more divergent approach. While formal learning is individual and highly organized, the rest of life is more social and unpredictable.

2.2.4 e-Learning
e-Learning can be aligned with tools and pedagogies across the continuum from conforming and passive to diverse, interactive and self-directed. On the teacher directed side, e-learning is characterised by downloading of information, class websites or content/learning management systems, whereas the learner-directed end of the continuum is characterised by diverse learning opportunities within communities of learners/practice and personalised learning environments using social networking Web 2.0 tools. In traditional forms of learning the teacher or institution has control over the choice and management of the content and the assessment of learning. Learning in this sense is like a “walled garden” which is outside the context of the learner’s everyday life, environment and informal learning. Personalised learning environments reverse the process and put the learner at the centre (Attwell 2007). A personalized learning environment is where the tools and, to varying degrees, the choice of content for any particular subject area belong to the student and the boundary between formal learning and informal everyday learning is blurred. PLEs are a potential model for opening the ‘walled gardens’ of the educational institutions to outside worlds (Attwell 2007).

2.3 The context zone of the alignment the eLAG
While shifts in both technology and pedagogy show significant potential to disrupt or change traditional ways of teaching and learning, it seems that for educational institutions the ‘business-as-usual’ format of classes and lectures, projects and exams, and tightly prescribed content and curricula still dominates. As Snowden puts it, “one of the great challenges is going to be to allow a co-evolution of the capability of 2.0 tools with the needs of organizations” (Snowden 2007:3). This co-evolution of contextual issues range from formal to informal and can be considered in a number of different layers as outlined in Figure 3 below:
2.3.1 Community and Institutional characteristics:

The stability and consistency of educational structures are both its strength and its weakness. The strength is evident in its endurance, but the weakness is becoming increasingly apparent in its inflexibility to adapt to changing times. The Industrial and Information eras saw the rise of the large educational institutions based on a hierarchical structure, which suited the prevailing emphasis on scientific and empirical modes of knowledge. Within this structure, centralised and standardised systems emerged for managing teaching and learning, the legitimacy of knowledge, and the evaluation and progress of teachers and learners (Howley and Harnett 1992). In a knowledge society however, a more flattened and horizontal approach might be better aligned with new technologies and pedagogies that facilitate organic networks of knowledge management through online interactions and connections (Hinton 2007). Biggs (1996) sees the managerial model and quantitative framework of institutional control of universities as often operating at the expense of a more learning focused orientation. Tensions arise, for Biggs, when administrative convenience wins over educational considerations.

2.3.2 Discipline characteristics:

Linked to the range of institutional characteristics that influence learning, so too can discipline specific characteristics determine the kind of pedagogy and technology suitable. Some areas tend to align more with a didactic pedagogy and e-learning technology that facilitates content management. Other areas align more with the flexible end of the continuum where creativity and diversity are encouraged and learning is facilitated more through collaboration within communities of learners or communities of practice. Social constructivist pedagogies and technologies that afford networking and co-creation of content are better aligned with this orientation.

2.3.3 e-Learning orientations:

Mitchell (2007) describes the e-learning landscape and information literacy focus of academic institutions as being represented in terms such as: accredited, age-specific, authoritative, reputable, scholarly and structured. This is contrasted with the learning landscape of many students' personal information experience which she describes as diverse, fast, global, immediate, informal, innovative, and media-rich (Mitchell 2007).
While dichotomies are not always helpful or accurate, this distinction can be mapped onto the continuum outlined above in the context zone of the eLAG and raises tensions that need consideration when designing e-learning environments. Mitchell’s analysis highlights again the distinction between the formal institutional approach where commercial, copyrighted, peer-refereed and published material is considered suitable for selecting and cataloguing information and content, whereas at the informal end of the continuum many students’ informal learning experience is open, opinionated, participatory, personalized and very public. Resources are shared, tagged and generative. (Mitchell 2007) The difference between these two lies in issues of power and control of learning and accreditation.

3. Application of the e-learning guide

e-Learning involves a complex interlinking of pedagogy, technology and context, and the e-learning alignment guide (the eLAG) provides a way of considering alignment of these dimensions when designing e-learning environments. For example, in vignette one on Samantha’s learning, early forms of e-learning support a uni-directional (teacher to student), transmission mode, monological pedagogical style where the technology used by teachers and learners aligns with information and content transfer using CD-Roms and personal computers. Later forms of technology, know as Web 1.0 or networked computers align with an e-learning approach which accommodates learner interaction within a community of learners – as outlined in scenario two of Paula’s learning - through the use of Learning Management Systems. This allows for bi-directional (interactive, conversational) interaction but is largely driven by the institution and teacher through the use of software prescribed by the institution and course content structured by the teacher. Emerging tools such as blogs, wikis, podcasts and other social networking tools and folksonomies of web 2.0 (Downes, 2006) align with a different, more individualised conception of pedagogy and knowledge management – as outlined in scenario three of Grant’s learning – which accommodates multi-directional (networked, multi-conversational) learning.

4. Conclusion

This paper outlined the influence of the areas of technology, pedagogy and context on e-learning practice. Three vignettes relating to e-learning were presented providing the background context within which to discuss the design of an e-learning alignment guide (the eLAG). This alignment guide offers practitioner a perspective on navigating the changing and complex terrain of e-learning and teaching, and highlights the importance of aligning the three e-learning zones of context, pedagogy and technology. Without alignment, tensions arise — particularly where new technologies are at odds with current institutional contexts. The resolution of these tensions provides a rich area for ongoing research.

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Reinventing Papert’s Constructionism - Boosting Young Children’s Writing Skills with e-Learning Designed for Dyslexics

Karin Tweddell Levinsen
University of Aarhus, Copenhagen, Denmark
kale@dpu.dk

Abstract: Since the consent to the Salamanca Statement on special needs education from 1994, e-learning developers have focused on tools aimed to support dyslexic learners. The importance of these efforts is on display every year in the Special Aids exhibition area at the BETT-event in London. ICT and e-learning is now widely used in the special needs education for dyslexics. However, the Salamanca Statement also inspired the vision of The Spacious School and the idea that children with learning disabilities should be transferred from special classes and included in the ordinary classes in primary schools. In the beginning of this process, the children with special needs were present in the classroom with their compensational aid, e.g. e-learning, ICT and special teacher support, and they were rarely included in the socially organised learning activities. Consequently, class teachers and subject teachers were not aware of the existence and potentials of the special compensational e-learning and ICT tools.

In recent years in Denmark, ICT has changed from being present in schools to becoming an available, everyday resource. That is, ICT and computers move out of the computer rooms and into every school room. I.e. most pupils use ICT, e-learning and computers in various contexts whenever it seems convenient. The increasing use of ICT in schools has paved the way for new ways of including the children with special educational needs and while knowledge of dyslexic compensational e-learning and ICT tools was earlier restricted to the special teachers, teachers in general have now become aware of the existence of these tools. Within the frame of a large scale research project in primary schools in Denmark (Project IT and Learning – PIL), this change of awareness led to teacher-initiated experiments with the Danish e-learning special needs-software CD Ord in first and second grades. The teachers wanted to see whether these tools could inspire normal children as well as children with special educational needs to start writing their own stories.

The paper presents the research findings from the empirical studies of experiments in Second grade. The paper concludes that most children in the experiments wrote longer and more complex stories than normally expected from this age-group. The children with a visual learning style in particular demonstrated a significant progress.

Keywords: e-learning, writing skills, reading skills, storytelling, dyslexics, special needs, constructionism

1. Introduction or background

From 2002-2004, the Danish Ministry of Education (UVM) supported a large-scale research- and development project on cross-country implementation of ICT in Danish primary schools called ITMF. In Gentofte – a suburb of Copenhagen – two primary schools were chosen for the ITMF project. As a follow-up on these local projects, Gentofte municipality initiated Project IT Learning (PIL) in order to root the results from ITMF and disseminate and apply them to the other schools in the municipality. Further, PIL was to initiate new research- and development projects in collaboration with the Danish School of Education (DPU). Where ITMF focused on implementation of ICT in general, PIL focused on ICT in relation to subject knowledge and competences. PIL’s objective was to create knowledge on how ICT possesses particular qualities that can contribute to constitute relations between subject knowledge, learning and ICT in new ways that enhance learning (Levinsen & Sørensen 2008).

The project involved subject-related research- and development of:

- Danish as first language and ICT/e-learning
- Language and ICT/e-learning: English and French
- Nature/Science and ICT/e-learning: Physics, Chemistry and Nature/Science

Further, the project defined special areas of interest for research and development:

- Pedagogic knowledge management
- Interactive whiteboards
- Special needs education: CD Ord

Within these areas, teachers developed model-projects based on their own practice and context. The research was carried out as a combination of anthropological and action research methods.
The ITMF findings pointed at positive relations between the writing process, ICT, and learning. It was found that multi-modality allows for a variety of means of expression which seem to support the consistency of the children's writing. These findings relate to form, content, vocabulary and repertoire of styles. Therefore, the PIL Danish-as-first-language model-projects focused on ICT as a motivating and supporting factor in relation to writing. The ITMF project also featured projects testing the so-called IT-backpack for dyslectic children (Levinsen 2007). Here it was found that the backpack - a laptop PC, scanner, scanner-pen, headset and compensational software -, helped integrate dyslectic children in normal classes. Especially the application CD Ord promised potential (“Ord” is Danish for “word”). In PIL, CD Ord model-projects took outset in exploiting CD Ord’s speech synthesizer as an intrusive compensation addressing the child’s receptive language skills: listening and reading. However, a consequence of the extensive ITMF effort is that ICT has become an available, everyday resource in Danish primary schools and accordingly, we observe an increase of general knowledge of ICT’s pedagogic potentials among school teachers. Additionally, children with special needs are included in normal classes with their compensational ICT-tools and therefore class teachers become aware of these specific tools. For PIL, this development led to an unpredicted convergence between the originally separate model-projects in Danish-as-first-language-teaching and CD Ord projects. Some Danish-teachers initiated experiments on their own using CD Ord in first and second grades. The teachers wanted to see whether the tool could inspire normal children to start writing their own narratives. These experiments are the subject of the current paper.

2. Danish subject objectives

According to UVM (UVM Shared Objectives 2008), the aim of Danish teaching in primary schools is to promote the pupils experience of language as a source for personal and cultural identity development based on aesthetic, ethical and historic understanding. The teaching supports the pupils' inclination to use language communicatively in a personal and all-round fashion. The education improves the pupils’ awareness of language and their development of an open and analytical attitude towards present and historic styles of expression. Pupils achieve enjoyment of reading and writing and increase their engagement with literature. As a subject, Danish encompasses both general education and subject objectives. The subject objectives include receptive, productive and literary competencies.

In relation to the first and second grades, the specific objectives of relevance to PIL are (UVM Stage Objectives 2008):

- **Spoken language**: The ability to make conversation, to collaborate and present subject matters, to know expression styles within different genres as story and fairytale, and the ability to identify and discuss basic narrative elements.
- **Written language – writing**: The ability to write simple fiction in different genres as story and fairytale based on personal experiences, imagination or other texts, to know basic semantics and to achieve basic computer literacy.

These objectives are to be met during the first two years of primary school and they are assessed at the end of second grade. As the experiments took place early in second grade, the children in the current cases had not yet achieved the objectives.

3. CD Ord

CD Ord is a compensational aid for anyone with severe reading and spelling disabilities. The application is produced by the Danish company Mikro Værkstedet (http://www.mikrov.dk/). The tools are intuitive and easy to use, even for small children. There is an interface for control of text recitation (figure 1 a) and an interface for word-suggestions (figure 1 b).

All digital (e.g. MS Word, homepages) and OCR-scannable text (Optical Character Recognition) can be read aloud by the speech synthesizer, using the voice Carsten (a typical Danish male name). Carsten is good at reading coherent text, e.g. stories, news paper articles or web pages. Carsten is fluent, but lacks intonation and makes occasional mispronunciations. For shorter sequences or separate words, CD Ord offers natural speech. This voice has perfect pronunciation and varies the intonation according to context. The natural voice is not suitable for longer passages because it becomes monotone. The application offers settings for various reading strategies and stages of development of the users reading skills. Among other features, CD Ord’s word list offers alternative and contextualized word suggestions along with homophone words. When the user performs a mouse-over, the words are read aloud. The alternative suggestions help users who have difficulties with the beginning of words or with the transformation of sound into letters.
Figure 1: The CD Ord interface (a & b) in relation to browsers and MS Word

4. The cases

Literacy and an inclination to write presuppose something to write about, and the writers’ ability to produce a coherent narrative structure. Therefore, the Danish- and ITC model-projects combined the writing process and the children’s own production of stories. The ICT-tools used in the projects offered interaction with images, writing and sound/speech for production of audio-visual products, e.g. PowerPoint- or PhotoStory presentations. ICT and especially working with images were seen as catalysts for the children’s creative process. The principles of the linear narrative and genres were introduced before the children began to work on their own.

Several Danish teachers saw the potential in CD Ord and chose to use the application in ordinary Danish-teaching in the first and second grades. The idea was that easy access to word lists and speech generation may fuel the children’s inclination to write their own stories. The teachers were inspired by constructivist and experience based learning principles (Kolb 1984, Själö 2000, Illeris 2006) and recommendations from recent research (Frost 2000, Trageton 2004, Elbro 2006, Bjerre 2007). On this basis, they wanted to apply CD Ord’s ability to address the children’s productive language competencies: speech and writing. Additionally, CD Ord allows users to select their favourite learning approach (Rasmussen 2006). Consequently, the young children may construct narratives using their preferred strategy, based on their established competencies. The teachers also draw on social learning principles, as the children in the current cases either work in pairs or communicate freely with each other during the sessions (Jessen 2001, Illeris 2006)., while constructing ad hoc Communities of Practice (Wenger 1998).
The teaching took place in the early autumn of 2006 and the children had just started second grade. Together, the two classes comprised some forty pupils. The empirical data was produced though participatory observation (Hasse 2002, Hastrup 1999) and documented though Thick Description (Geertz 1973). All the pupils were observed but as the research is qualitative, the case presentation and the findings refer to two specific examples for the sake of clarity.

4.1 Thrills and horror in second grade

In this school, children have easy everyday access to computers. The children are fascinated by the horror genre and they understand the basics of constructing narratives. However, they find it difficult to write comprehensive action and their construction of suspense is without tension. The children work in pairs writing horror stories using MS Word and CD Ord. The teacher has produced a library of horror sounds in advance. As the children have no previous experience with digital sound, the teacher expects the sounds to serve as an external motivator. The project’s duration is three weeks, and the children work concentrated on the computer one hour each week. In between, they work with other approaches to storytelling.

The boys Asmus and Filip are paired by the teacher because Asmus is ‘visual’ and has a vivid imagination, but is easily distracted. In contrast, Filip is careful and literate, but unimaginative. They are both good with computers and on the first day they bring their handwritten principles of narrative structure and start the PC on their own. They find the teacher’s sound library on the memory stick and activate the sounds – a creaking door, a ringing bell. The creaking door is spooky and Asmus begins to fabricate a story. The teacher asks if there is anything missing in the story. Filip suggests somebody evil and Asmus suggest a living scarecrow who wants revenge. Asmus emphasize that the audience must not know right away, as suspense makes the story more exiting. Due to their different learning styles, it is not easy for them to start writing. Asmus got the story in his head, but does not want to write and when Filip writes, he corrects mistakes all the time and Asmus gets distracted while he waits. On the first day, they write two lines of the story. During the week, the teacher helps them write cue words and an outline for the story on paper. They found the teacher’s sounds boring, and have produced a list of sounds on their own: fire, laser guns, and exultation when the living pumpkins die. After half an hour, they have written 12 lines and Filip sits at the keyboard while Asmus wears the headset. Filip wants to write ‘looked’, but writes ‘loked’. He puts the cursor between o and k – ‘lo|ked’ - which causes CD Ord’s list to display words beginning with ‘load’. Filip moves the cursor over the list while Asmus listens and Asmus quickly understands that this list is of no help. Filip moves the cursor between k and e – ‘lok|ed’ – and now the list displays words with two o’s. Filip roll over the list while Asmus listens. Even before Filip reaches ‘looked’, Asmus points at the right word. Filip clicks on the word, and it appears in the story. On the third day, the boys fetch the headset, memory stick and their manuscript and start off with Filip at the keyboard. Filip writes ‘sombi’ and CD Ord list ‘som’-words. Something is wrong, and the teacher asks if the word could begin with another letter. ‘Z!’ they shout in unison. Filip writes ‘Z’, and ‘Zombie’ appears in the list. Asmus explains that the ‘e’ in the end is because the word is English. Now the story goes: ‘... an army of zombie pumpkins ...’. Gradually, the boys begin to negotiate change of vocals, first letters and endings by combining memories with suggestions in the list and Carsten’s reading aloud. Later, when Asmus is at the keyboard, he remembers that ‘Zombie’ begins with ‘Z’. However, he forgets the ‘e’ in the end, even though he knew it earlier. Asmus has difficulties with words’ endings. Many negotiations and lines later, the Zombie army is defeated with laser guns and this must be celebrated in the story. Filip writes ‘cake and soder water’. Asmus says: “sodor”. Together they look in the list and Filip moves the cursor. Asmus becomes exited: “There it is – ‘soda water’!! – it’s ‘soDA’ water”. This is the end of the story and they let Carsten read it aloud to check the narrative as a whole.

4.2 Second grade continues the teacher’s story

In this school, the children have limited access to ICT and computers. In the first grade, they had basic ICT literacy and they know how to log in and write messages; they know MS Word and understand the basics of CD Word. The teacher wants to test whether CD Ord and MS Word are useful catalysts for storytelling, writing and spelling. The class has worked with storytelling before the day in the computer room. The teacher told an exiting story, but stopped at a cliff-hanger, and the children continued the story by fabricating, drawing and writing a draft by hand. Today they are to write their stories on the computers. The class is divided in two groups because of the limited size of the computer room. The pupils are sorted by gender, because the boys are more mature and computer-literate than the girls. The computer room is booked for two hours for each group. There are nine girls in the group and as soon as they enter the computer room they start on their own: log on, MS Word, CD Ord, and begin to write from the draft. They are exited about
the headsets and the voice generator. The girls work in pairs but three girls work alone as their partner is missing due to illness. Two teachers function as consultants and help the children when necessary.

Alice and Sophie begins their story: “A wonderful summer ...”. They write letters and immediately find the word in CD Ord’s list when Carsten reads aloud. They share the headset and soon they drift off into listening to unfamiliar words: “social democracy”, “That’s the workers” says Alice and laugh. Sophie figures out how to generate compound nouns in the list. In Danish, compound nouns are one word where in English they stay separate, e.g. English: summer day and Danish: summerday Sophie finds out that if she double-clicks at the word “summer” in the list, the list displays compound nouns. They need “summerday” for the story and Sophie tells Alice to correct “summer day” into “summerday”. Afterwards she tells the other girls how to use her discovery.

Oline works alone. During the preparation, where they were supposed to write drafts, she has written nothing at all and the teacher is a bit worried. In general it is difficult to persuade Oline to write. However, she has produced some very fine drawings – a cartoon draft. Oline starts the computer and apparently she just fiddle aimlessly about. Suddenly she seems to catch the principle of finding words in the list. After half an hour she leaves the story she had planned in her cartoon draft and begins to fabricate and write directly out of her head. At one point she wants to write “play” but writes “doctor” (In Danish play is “lege” while doctor is “læge”). When she listens to her story, it obviously sounds wrong. The teacher suggests that she think of other letters than “æ” that may sound more right and she finds the right word “lege”. Later, she needs a doctor in the story and this time she does not even use the list. She also construct complex words as “emergency room” and “ambulance service” in various inflections by combining spoken language with writing and listening to her own writings as well as the list. She manages to write about 400 words of formidable story.

5. Findings in relation to Danish subject learning objectives

5.1.1 Thrills and horror

When Asmus and Filip work on their story, they point at the screen and compare sentences in one part of the text with sentences in other parts. They draw lines in the air in front of the screen while talking. This is possible because the text is externalized and thus easier to share and negotiate. E.g. Asmus and Filip have a long discussion on how their heroes - a farmer and his two sons - are to fight against the revengeful scarecrow’s army of zombie pumpkins. The horror genre conventions prescribe that suspense is build up though three phases. Now the boys are aware that their three events are alike – they must be different as Asmus says “... or it will be boring”. The list also inspires varied negotiations on content and form, as the boys become aware of their redundant use of words and start to search for synonyms. From day one to day three, Asmus and Filip displays an evident change of language awareness and they develop an analytical attitude towards the horror genres styles and means of expression.

As they worked together, Asmus becomes more concentrated and focused and Filip becomes more free and imaginative. In the beginning, Filip notice the prescriptive error that the story misses an evil character. When Asmus suggests the revengeful scarecrow, Filip begins to define a scarecrow: “A scarecrow frightens the birds away from the strawberries”. Then Asmus gives Filip a lesson in storytelling: “When the farmer was a boy he accidentally pushed someone over the cliff. He died. It’s his spirit – his soul – inside the scarecrow. It wants revenge ... Kill the farmer”. On the last day Filip shows that he has become more free as he wants to end the story: “And then they cheered and now they are going to drink a pint of beer”. In return, Filip’s insistence on correct spelling helps Asmus to confront the endings that causes him so much trouble (in Danish the ending of a word, equals English “the”, e.g. Danish: “en hær”, “hær” and English: “an army”, “the army”). Reluctantly he begins to be more careful:

*Filip:* “You wrote ‘hær’ - It has to be ‘hæren’”
*Filip:* “You wrote ‘fant’”
Asmus corrects to ‘fandt’ without using the word list and writes on.
*Filip:* “you have to write ‘laser sword’”
Asmus insists that he spelled it correctly, but he has written ‘lyser sword’.
*Filip:* “it says ‘lyser’”
Asmus corrects: ‘No it says ‘laser’”
... and a little while later ...
Filip: "It has to be 'laser light'"
Asmus: "That's what it says!!!!!!!!!"
He reads again ... "well, no" ... and corrects the error.

In the end, Filip is writing and Asmus shows that he actually wants to care about the spelling. Filip has written "cookies and soder water". Asmus can see the mistake because MS Word redlines spelling errors, and he suggests: "It's 'sodor'". Then they both look at CD Ord's list. Filip makes a roll-over and Asmus yells: "There it is! It's 'soda water', it's called soDA water!". The soda water sequence is also a fine example of how the list and the recitation function interact with the children's spoken language. None of them knew how to spell 'soda water'. Filip began by saying the word very slow and constructed the right beginning: "sod". This was enough for the list to generate useful suggestions. By listening to the recitation they noticed the right spelling, which Asmus emphasised by saying "soDA water!". In the last hour of writing they often use this approach, either because the story needs a certain word or because they want to vary the language, e.g. laser light, light laser, army of zombie pumpkins or pumpkin zombie army.

5.1.2 Second grade continue the teachers story

Except for Oline, all the girls have handwritten a draft and they begin to copy the draft word for word into a MS Word document. When they notice the red error marking they listen to the words in the list and import the right word to the story. This procedure is very slow, because most of the girls cannot remember the keyboard and also lack basic ICT-skills such as the double click, delete, forced- and auto-carriage return etc. When they want to change a word, they use back space and remove the whole word or even a whole sentence, before they rewrite all over. Consequently, they are easily distracted by CD Ord as a kind of word game. They begin to write letters in MS Word, in order to see what the list generates and then they explore strange and funny looking words. Apart from Alice and Sophie who discovered how to generate compound nouns in the list, and Oline who fiddles about, the progress of the stories is rather slow during the first session (45 min.). This demonstrates that copying from a draft is no big challenge, but that the lack of basic keyboard-skills may be a barrier. Also, copying does not appear to be a very good exercise, if the objective is to train computer literacy or storytelling. So, the girls drift off into exploring the word list in CD Ord. However, the session in the computer room is two hours long, and gradually something changes. The girls listen to the recitation and realize that their stories are boring and begin to negotiate the problem. Gradually, they move from exploring words at random to improve their story by adding new ideas and finding synonyms. However, the stories are no longer than 10 sentences (50-90 words).

Oline is working quite differently. She has produced a kind of cartoon that reproduces the teacher's story up to the cliff-hanger. She spends a long time apparently clicking stuff at random in CD Ord. When she starts writing, she transforms the cartoon into words — it is a story about two siblings who play together. The little brother teases his sister and she ends up knocking his head with her clog. It is early in this sequence that she needs the word for play 'lege' but writes the word for doctor 'læge'. When she realizes something is wrong and she gets stuck, she asks the teacher for help. The teacher asks: "Do you know what the word 'læge' means?". "That is someone who operates sick people" Oline replies. Then they talk about changing letters/sounds and she understands the change of æ to e. From this point on, she has no problem swapping vowels and soon she gets to the end of the cartoon draft. After half an hour she begins to fabricate freely. The little brother's wound is getting serious and now Oline needs a doctor in the story. She remembers the spelling without using the list. When the doctor arrives in the story he needs the ambulance service and the little brother must be taken to the emergency room at the hospital. When the session is over, Oline has written half a page — a dramatic and action packed narrative with many difficult words and a fairly complex syntax.

6. Conclusion

CD Ord was originally designed as a compensational tool for dyslexics. However, the cases demonstrate that the use of CD Ord as an interactive e-learning application in ordinary classes makes good sense. In both cases, children who have just begun second grade approach or surpass the learning objective for the end of second grade.

The children developed a method of using their productive language competencies together with CD Ord as an interactive sparring partner and were able to construct the desired words for their stories. They experimented and listened to the recitation of the word list and their own writings. In both cases the use of the list changed during the sessions. In the beginning the children used CD Ord to control spelling and they preferred to find the word in the list rather than write it themselves. Gradually, they began to construct more
complex words and use the text list as an interactive and explorative tool. At the end of the sessions, most children – and especially the children in the described cases – had changed the way they used the list. Now they only searched for new words after they had negotiated the structure and the progress of the stories. The amount and complexity of words they could spell directly without the use of CD Ord increased remarkably during the writing sessions along with grammar skills, e.g. correct inflection and endings. Apparently the shared, externalised text on the computer screen, along with the audio feedback from CD Ord and the visual error-feedback from MS Word function as a catalyst for the growing urge to produce a good story. Asmus and Filip, who fabricated their own horror story, ended up negotiating the attributes and presentation of their characters, how to build suspense, and how to vary the language. Oline, who surpassed the content of her cartoon draft, worked with the text on a higher level. She regularly listened to Carsten’s recitation of her story and made changes that enhanced the momentum and suspense of her story.

In conclusion, the application of CD Ord as interactive e-learning in ordinary classes is successful. However, Oline and Asmus are especially interesting as they both had a preference for visual and verbal expressions, and both had tried to avoid writing. Before the CD Ord sessions, both teachers were worried about the children’s attitude towards writing, but after the sessions Asmus’ teacher was very confident, while Oline’s teacher was rather taken aback by Oline’s achievement. In this sense the pedagogic setup displays strong similarities to Seymour Papert’s Constructivism (Papert 1980, Papert 2000), while both Oline and Asmus resembles Papert and Turkle’s (1990) description of the bricoleur approach to learning.

The cases represent only a limited set of data, which cannot alone support wider conclusions. However, the cases were fundamentally different; both in context and setup’s, and their only shared features were the specific use of CD Ord and certain pupils’ reluctant approach to writing and their vast progress. A large body of studies confirm the learning effect of constructionist pedagogic design and therefore it seems reasonable to claim that the cases demonstrate the potential of interactive e-learning in relation to pedagogic design and support of varying learning preferences and learning difficulties.

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References
A Data Warehouse Model for Micro-Level Decision Making in Higher Education

Liezl van Dyk
University of Stellenbosch, South Africa
lvd@sun.ac.za

Abstract: An abundance of research, by educational researchers and scholars of teaching and learning alike, can be found on the use of ICT to plan design and deliver learning activities and assessment activities. The first steps of the instructional design process are covered quite thoroughly by this. However, the use of ICT and qualitative methods to close the instructional design cycle by supporting sustainable decision making with respect to the evaluation of the effectiveness of teaching processes hold much unleashed potential. In this paper a business intelligence approach is followed in an attempt to take advantage ICT to enable the evaluation of the effectiveness of the process of facilitating learning. The focus is on micro-level decision support based on data drawn from the Learning Management System (LMS). Three quantifiable measures of online behaviour and three quantifiable measures of teaching effectiveness are identified from literature to arrive at a 3x3 matrix according to which 9 measures of e-teaching effectiveness can be derived by means of pair-wise correlation. The value and significance of information are increased within context of other information. In this paper it is shown how the value of LMS tracking data increases within context of data from other modules or others years and that useful information is created when this tracking data is correlated with measures of teaching effectiveness such as results, learning styles and student satisfaction. This information context can only be created when a deliberate business intelligence approach if followed. In this paper a data warehouse model is proposed to accomplish exactly this.

Keywords: learning management system, data warehouse, student tracking, decision support, student feedback, learning styles

1. Introduction

In a paper, commissioned by the EDUCAUSE Centre for Applied Research, Goldstein & Katz (2005) coined the terminology Academic Analytics to refer to Business Intelligence within an Educational setting. They argue that Business Intelligence “rang hollow to our delicately trained academic ears”. Business Intelligence entails the gathering of data from internal and external data sources, as well as the storing and analysis thereof to make it measurable, so as to assist and sustain more efficient and longitudinal decision-making (Kimball, 2002 and Immon et al., 2001).

An abundance of research, by educational researchers and scholars of teaching and learning alike, can be found on the use of ICT to plan design and deliver learning activities and assessment activities. The first steps of the instructional design process are covered quite thoroughly by this. However, the use of ICT and quantitative methods to close the instructional design cycle by supporting sustainable decision making with respect to the evaluation of the effectiveness of teaching processes hold much unleashed potential.

Each time a lecturer or student logs into a Learning Management System (LMS), participates in an online discussion, completes an electronic quiz or reads an electronic document, an electronic transaction is performed. With each transaction performed, data are captured by the LMS. As a result loads of data are created, which are most often only archived for record keeping purposes and not used to support decision making. In this paper a business intelligence approach is followed in an attempt to take advantage ICT to enable the use of such data to evaluate the effectiveness of the process of facilitating learning.

1.1 Scope

Strategic, tactical and operational (micro-level) decisions are made throughout any organisation. On all three of these levels, examples can be found of data that are appropriately transformed into information to become valuable decision support tools. The teaching process is one of the primary micro-level business processes of a Higher Education Institution (HEI). The focus of this study is specifically on this micro-level and considers the intelligent use of data to support the lecturer and programme co-ordinator in making decisions concerning the teaching process.

In its broadest sense, e-learning can be defined as the facilitation of any type of learning by means of any type of information and communication technology (ICT). In line with the learning-centered approach towards teaching the purpose of the lecturer is to facilitate the learning process, rather to simply deliver knowledge. Within this context the terminology e-teaching is used in this paper to refer to the facilitation of learning by
This discrimination is made intentionally, since the focus of this paper is not the cognitive learning processes (what is going inside the head of the learner), but rather on online behavior (what can be seen on the outside) and the correlation thereof with measures of teaching effectiveness. Furthermore, in terms of ICT, the focus of this study is on Learning Management Systems (LMSs).

1.2 Framework and methodology

A business intelligence framework within context of an HEI is shown in Figure 1. This framework is adapted for the purposes of this paper from Kimball’s (2002) generic business intelligence framework. Sources of data (left-hand side of framework) are extracted, transformed and loaded into a data warehouse, consisting of a number of data marts (middle of framework). Data from this warehouse is then organized in such a way to allow either ad hoc analyses or standard business measurement (right-hand side of framework). This paper reports on literature pertaining each of the elements of this framework, specifically measures of e-teaching effectiveness. These measures are then consolidated in an attempt to provide a set of standard measures. The use of these measures to support longitudinal and contextualized decision making is then demonstrated by means of a case study.

![Figure 1: The business intelligence framework](image)

2. An overview of business intelligence practices followed at HEIs

EDUCAUSE maintains a directory of data warehouses in higher education as part of the activities of the EDUCAUSE decision support and data warehousing constituent group (Heise, 2007). Since the first contribution was made to this directory on 16 November 2000, the number of participating HEIs has grown to about 100 institutions, primarily from the United States but also from Europe. This is not an exhaustive directory of data warehouses in higher education, but it is sufficient to guide the following overview of the typical source systems, technology to extract, transform and load (ETL) data, data warehouse architecture and business areas addressed within Higher Education:

Enterprise Resource Planning (ERP) systems, Student Information Systems (SIS) and Learning Management Systems (LMS) are typically source systems for the data warehouse. Transactional data is captured and stored by these systems. This data is extracted, transformed and loaded (ETL) into the data warehouse. The most common databases used by HEIs are Oracle and MS SQL server. The minority of HEIs use specialized tools to extract, transform and load data. The majority of HEIs either developed home-grown scripts using generic tools, or use the ETL facility of the database. Specialized front end reporting tools (e.g. BrioQuery) are most common. Generic data analysis tools such as MS Excel and MS Access, as well as home-grown querying tools, are used. There is not one predominant ETL tool: the ETL tool selection is rather a function of existing and available technology.
The EDUCAUSE HE data warehouse directory contains data marts such as alumni, prospective students, modules and facilities. Most analyses drawn from these data marts are designed to support decision-making on strategic level. Some operational and micro-level decision support is provided in the form of customer (student) relationship management (CRM) type of queries to enable marketing and communication targeted specifically at potential students or donors.

3. A business intelligence approach towards the evaluation of the effectiveness of e-teaching

The business intelligence framework is now approached from the right hand side, starting measures of e-teaching effectiveness (Figure 2). No evidence is found in the EDUCAUSE HE data warehouse directory (Heise, 2007) of micro-level decision support towards the evaluation of e-teaching. Hence, evidence from other literacy sources are brought together to arrive at a set of measures of e-teaching effectiveness. Measures of teaching effectiveness are considered in the first instance (3.1) and secondly measures of the online behaviour (3.2).

![Figure 2: Measures of e-Teaching effectiveness](image)

### 3.1 Measures of e-teaching effectiveness

Alavi (1994) and Lu et al. (2003) explain that teaching effectiveness can be measured in terms of a student's results or satisfaction. Felder and Brent (2005) add a third measurement for teaching effectiveness when they made the statement that consistent proof exists that teaching is more effective if learning styles are taken into account.

#### 3.1.1 Learning styles

A large number of standardized, validated learning styles assessment instruments are available. These instruments typically enable the quantitative measurement of student learning styles against certain dimensions. Examples of studies that compare learning styles indices with online behaviour are listed in the first column of Table 1. The specific learning styles instrument and the number of students involved are listed in columns two and three respectively. Conclusions concerning the correlation found between learning styles and online behaviour (as measured by total number of hits), are reported in the last column.
Table 1: Correlation between learning styles and LMS tracking information

<table>
<thead>
<tr>
<th>Study</th>
<th>Learning styles instrument used</th>
<th>N</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Hutchens, 2002) Delta State University</td>
<td>Eysenck Personality Inventory (EPI)</td>
<td>93</td>
<td>No correlation between LMS activity and learning style.</td>
</tr>
<tr>
<td>(Hoskins and Hooff, 2005) University of Portsmouth</td>
<td>Study inventory</td>
<td>110</td>
<td>No correlation between LMS activity and learning style.</td>
</tr>
<tr>
<td>(Johnson, 2005) Grant MacEwan College</td>
<td>Alienation subscale of the classroom life instrument</td>
<td>53</td>
<td>According to the author some significant correlation was found, but no details are provided.</td>
</tr>
<tr>
<td>University of Houston</td>
<td>Group embedded figures test (GEFT)</td>
<td>96</td>
<td>“Field-dependent” students hit much less often on “teaching notes” and other class resources than any other learning style group did.</td>
</tr>
<tr>
<td>(Zywno, 2003a) Ryerson University</td>
<td>Felder index of learning styles</td>
<td>338</td>
<td>The active-reflective dimension yielded a positive correlation with LMS activities.</td>
</tr>
<tr>
<td>(Simpson and Yunfei, 2006) University of North Texas</td>
<td>Kolb’s Learning-Style Inventory</td>
<td>169</td>
<td>Learning styles statistically impact student participation terms of hits.</td>
</tr>
</tbody>
</table>

3.1.2 Student results

Student results (e.g. examination marks) are used in most studies as measure of teaching effectiveness. Authors such as Hutchens (2002), Lernihan (2002), Alstete and Beutell (2004), Kofoed (2004) and Green et al. (2006) reported a significant positive correlation between the total number of online hits (mouse clicks) logged per student and the final result per student. Baugher et al. (2003) and Biktimirov and Klassen (2006) are the only authors that report the rejection of the null hypothesis that there is a positive correlation between number of hits per student and final result per student. Biktimirov and Klassen (2006) did, however, find a significant positive correlation between the hits on homework solutions and final results per student.

3.1.3 Satisfaction

Sly et al. (2005) developed a survey specifically for their study. A likert scale of 1 (strongly agree) to 5 (strongly disagree) was used to measure the effectiveness of the WebCT component in terms of satisfaction. Stoel and Lee (2003) collected data about how frequently students use WebCT as measured in hours. Although this type of information can be derived from access logs, it is not available through summarized reports. Hence, Stoel and Lee (2003) assumed - as most other action researchers do - that this data is not available.

Additional data need to be gathered if information is needed concerning previous experience with WebCT, perceived ease of use, perceived usefulness, attitude and intention of use. Wharrad et al. (2005) used a survey to gather data concerning students’ experience using WebCT. Zywno (2003b) specifically designed a survey to measure indicators of student attitudes towards hypermedia-enhanced instruction. Green et al. (2006) also consulted results from the Southampton University module evaluation questionnaire. Shu-Sheng Liaw (2007) investigates learner’s satisfaction and behavioral intentions to arrive at the conclusion that self-efficacy is a critical factor that influences learners’ satisfaction.

3.2 Measures of online behaviour

By far the majority of studies that attempt to measure the effectiveness of e-learning use the aggregate data provided by the student tracking report of the LMS. This report only typically provides data concerning the total number of hits per student per module. Hence, this is the most popular variable used in studies.

Baugher (2003) introduced a concept hits consistency and defines it as the degree to which hits are consistent across the term. He determines hits consistency by assigning a 1 when one or more hits occurred between class meetings and 0 if no hits occurred. Baugher (2003) gathered data for his study by taking a snapshot tracking report each day of the term. Biktrimitov (2005) also used this measure. In both studies hit consistency correlated significantly with final student results. For purposes of this study a third measure is included, namely total time per student per module.
3.3 Measuring method

Statistical regression analysis refers to a family of quantitative methods for determining the correlation between a dependent variable and one or more independent variables. All of the previously discussed measures are quantifiable, which make it ideal for regression analysis. Given these two sets of measures, nine (3 x 3) correlation coefficients can be determined statistically, as shown in Table 2.

Table 2: Correlation between teaching effectiveness and online behaviour

<table>
<thead>
<tr>
<th>Measures of teaching effectiveness</th>
<th>Results</th>
<th>Learning Styles Index</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hits per student per module</td>
<td>1</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Total time per student per module</td>
<td>2</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Hits consistency</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

4. Case study

In the third part of this paper a case study is described to evaluate the usefulness of following a business intelligence approach. This case study is based on data from one specific faculty from the University of Pretoria (2005 and 2006). The University of Pretoria has nine faculties, in which more than 500 programmes are offered. It is the largest residential university in South Africa and provides training for approximately 50 000 students, of which about 30 000 are residential students. In 1997 the University Council approved telematic education as a mainstream activity of the University and the Department of Telematic Education was established (Lazenby, 2002). WebCT was installed for the first time at the University of Pretoria in 1998. The electronic tracking data for purposes of this study was drawn during 2005 and 2006, during which time period WebCT Campus Edition 6 was used.

Within this faculty, undergraduate as well as postgraduate programmes are presented. The undergraduate programme is presented through full time, residential courses in a blended learning mode. During 2005 nine out of eleven first year contact courses within this faculty had a WebCT presence. In 2001 the first WebCT learning environment was created for a second year course. From 2002 it was expanded to second year students, until all undergraduate and postgraduate courses in this faculty had some form of WebCT presence in 2005. The extent to which each of these are used depend very much on the way in which individual lecturers facilitate the learning process. By 2003 a WebCT presence was created for all third year courses in the undergraduate programme. The extent to which this presence was utilized depends greatly on the attitude of individual lecturers towards the use of ICT to facilitate learning. Since 2004 a WebCT presence existed for all undergraduate and post graduate courses in the department. This case study is based on 2005 (both terms) and 2006 (first term) WebCT tracking data.

4.1 Data marts

To ensure standardization and longitudinal studies, these measures are stored in standard measures data marts. Data for the three measures of teaching effectiveness are contained in the student data mart, while data for the three measures for online behaviour are contained in the click-stream data mart. Together, these data marts form the data warehouse, as shown in Figure 3.
4.1.1 Student data mart

The student data mart contains all of the attributes per student, including predicate results (progress marks/term marks), examination results and final results, as well as the Felder Learning Styles Indices for each student. Unfortunately, the student satisfaction data could not be included, since this data was gathered anonymously. Hence, the satisfaction indices cannot be associated with specific students and subsequently it is impossible to perform any statistical regression analysis with respect to this data.

4.1.2 Click-stream data mart

The click-stream data mart contains the measures of online behaviour. The tracks left behind by a student as he clicks his way through an LMS is called the click-stream. The click-stream data mart is an aggregate of this click-stream. This data mart contains one row for each seat on the LMS (student per module). In each of these rows the three measures of online behaviour are indicated:

- Total number of hits per student per module;
- Total time per student per module;
- Hits consistency per student per module.

4.2 Data sources

The content of the data warehouse is extracted from existing information systems (Figure 4). The click-stream data is captured by the learning management system (LMS), in this case WebCT campus edition 6. The format of this data is flat files (.csv). Several data cleaning and data integration processes were followed before this data could be loaded into the data mart. The student results were extracted from the student information system (SIS) before it was transformed and loaded into the data mart.

Data with respect to student learning styles: Felder’s (2005) instrument for the measurement of learning styles was used to measure the learning styles of students. Felder’s (2005) questionnaire was administered during 2005 by means of a WebCT quiz to all undergraduate Industrial Engineering students and the University of Pretoria. Participation was voluntary. This data was extracted from WebCT before it was transformed in such a way so as to allow statistical regression, and loaded into the student data mart.
4.3 Case study outputs and conclusion

The purpose of this case study is to demonstrate the usefulness of LMS tracking data to support decision making. To accomplish this, the student tracking data are quantified in terms of hits frequency, hits consistency and average time per hit. These indicators are correlated with performance per student per module as well as learning style index (Felder ILS).

The number of modules for which online behavior (number of hits per student; total time per module per student; hits consistency) correlates significantly with measures of teaching effectiveness (results and learning styles) are shown Table 3 and Table 4 respectively. For this study two sets of data are assumed to correlate significantly when p<0.05, which means that there is a 5% chance that the assumption is wrong. Hence, in Table 4 the grey results are considered to be co-incidental.

The online behavior data for the first term modules for which data are available for 2005 as well as 2006 are shown in Figure 5, Figure 6 and Figure 7 respectively, to allow longitudinal conclusions concerning the three measures of online behavior. Mazza and Dimitrova (2007) as well as Christobal et. al. (2008) illustrated, within context of Learning Management Systems, the value of presenting tracking data visually. Hence, these figures are presented as graphs, rather than a tables of data.

Table 3: Number of modules for which results correlated significantly with online behaviour

<table>
<thead>
<tr>
<th></th>
<th>Number of modules (out of 38) for which there is as significant correlation between respective results and ...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>... number of hits per student</td>
</tr>
<tr>
<td>Term mark</td>
<td>6 modules (16%)</td>
</tr>
<tr>
<td>Examination mark</td>
<td>16 modules (42%)</td>
</tr>
</tbody>
</table>
Table 4: Number of modules for which learning styles correlated significantly with online behaviour

<table>
<thead>
<tr>
<th>Learning Style Dimensions</th>
<th>Number of Modules (out of 43)</th>
<th>Number of hits per student</th>
<th>Total time per module per student</th>
<th>Hits consistency per student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Reflective</td>
<td>14 modules (33%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sensing Intuitive</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Visual Verbal</td>
<td>5 modules (12%)</td>
<td>0</td>
<td>2 modules (5%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Sequential Global</td>
<td>4 modules (9%)</td>
<td>1 (2%)</td>
<td>2 modules (5%)</td>
<td>3 modules (7%)</td>
</tr>
</tbody>
</table>
Although is it not shown in this paper, the measures and correlation indices per module are made available to learning facilitators by means of a teaching effectiveness dashboard per module. The results of this dashboard should be considered within context of the entire module. For example, in cases where no significant correlation was found between online behavior and results, the lecturer did not use the LMS for anything more than publishing the module framework. In all instances where number of hits correlated significantly with the Sequential Learning Style the calendar tool was used.

When looking at the bigger picture presented by Table 3, Table 4, Figure 5, Figure 6 and Figure 7 some interesting observations are be made:

- Students who tend to lean towards reflective, verbal and sequential learning styles generally are more active online.
- From 2005 to 2006 online activities increased amongst students in this department with respect to all there measures of online behaviour. This can be due to an increased availability of the LMS, an increase in utilization of the LMS by the learning facilitator or even an increase in the number of digital natives entering our HE system.
- In the case of two modules (NMC122 and BES210) different persons were responsible for these modules in 2006 and 2005 respectively. In these two cases there is more that average increase in online behaviour, which indicates that it is not the ICT itself that influence the effectiveness of teaching, but rather the way in which it is used.
- BNV110 and BPZ210 are the two modules with the highest indices of online behavior (number of hits, time online as well as hits consistency). These modules are presented by the same lecturer. Only this lecturer reflected critically as scholar of teaching and learning and acted upon the 2005 indices. Keeping in mind that the other modules draw upon the same student population, the conclusion is made from the graphs that the attempts of the BNV110/BPZ210-lecturer paid off in 2006.

5. Wider implications and future work

“Despite the availability of powerful computers, advanced network and communication infrastructures, and sophisticated software applications, university decision makers, still lack access to the critical information necessary for informed decision making” Guan et.al. (2002).

Business intelligence entails the gathering of data from internal and external data sources, as well as the storing and analysis thereof to make it measurable, so as to assist and sustain more efficient and longitudinal decision-making (Kimball, 2002 and Imnon et al., 2001). Considerable amounts of information and data are available and used to evaluate the effectiveness of teaching processes. However, this information very seldom contributes in a sustainable way to the intelligence of the business (HEI). In this paper a business intelligence approach was followed to arrive at measures of online behaviour (number of hits, time online and hits consistency) that can be used in a standardized way to allow decision support towards the improvement of teaching process in a sustainable way.

The value and significance of information are often increased within context of other information. In this paper it was showed how the value of LMS tracking data increases within context of data from other modules or others years and that useful information is created when this tracking data is correlated with measures of teaching effectiveness such as results and learning styles. This information context can only be created when a
deliberate business intelligence approach if followed. Even more context can be created for example when student feedback (satisfaction) data are gathered in way to allow correlation with online behaviour.

In many respects this paper leaves us with more questions than answers. However, a framework and approach are now defined and proved in concept, according to which LMS tracking data can be transformed into useful information in a efficient, sustainable and replicable way to allow information to support micro-level decision making for HEIs.

References


Technology-Assisted Reading for Improving Reading Skills for young South African Learners

Gerda van Wyk and Arno Louw
University of Johannesburg, South Africa
gvanwyk@uj.ac.za
alouw@uj.ac.za

Abstract: This paper addresses the controversial issues of improving the reading skills of young learners through technology-assisted reading programmes. On reporting the results of primary school learners from grade 2 to grade 7 who participated in a computer-based reading programme for seven months, we try to answer the critical questions of whether computer-assisted reading programmes should be embraced or avoided. We also have looked at the possible benefits of such an intervention apart from the improvement of reading skills.

The poorly developed reading skills of South African learners slowly became evident over the last couple of years as teachers, parents, employers and professionals were confronted with this ongoing crisis. The Department of Education (DoE) stated that the South African youth do not read as well as their foreign counterparts and actions were put in place to address the growing problem. However, despite this acknowledgement, decision makers are still indecisive in effectively addressing the problem. Many theories exist on why children are reading impaired and who should accept responsibility for it.

Data of the findings in this paper was collected over a period of seven months and reflects the reading results of learners who followed a combination of a computer-based reading programme, visual accuracy and visual memory computer exercises as well as the application of specific paper-based activities. Groups were small, with continuous personal intervention and communication from the facilitator with each learner. This paper also qualitatively reflects on the additional benefits or negative experiences of learners who participated in the electronic reading programme. The qualitative data was accumulated from interviews with learners and teachers involved.

The efficacy of the reading programme was evaluated through continuous assessment of learners’ performance on different aspects of reading, including reading speed, reading comprehension, spelling and language. The reading results obtained were compared with the initial reading assessment before implementing the programme. The overall experience of learners who participated in this programme provided valuable information in evaluating the reading programme as a whole.

Results obtained from this study indicate that improvement in reading speed, comprehension and spelling was unique to every learner individually. The benefits beyond the improvement of reading skills obtained as a result of the programme encompass many areas of the learners’ development, such as social learning, collaborative learning, finer perceptual motor skills, confidence and a general improvement in marks in other subjects.

This paper attempts to provide insights into the value and challenges of computer-assisted reading for primary school learners and into the importance of adapting teaching methods in response to a crisis.

Keywords: computer-assisted reading programmes, improvement of reading skills, evaluation, assessment, primary school learners, reading comprehension, mastering of reading skills

1. Introduction

The poorly developed reading skills of South African learners slowly became evident over the last couple of years as teachers, parents, employers and professionals were confronted with the ongoing crisis. The Department of Education (DoE) stated that the South African youth do not read as well as their foreign counterparts and that South African youth are of the poorest readers in the world (Howie 2007).

According to a report from Unesco, and the association for development of Education in Africa (ADEA), a learner should have at least six years teaching in the mother tongue and proper second language teaching to be at the same level as a learner who was taught in one exclusive international language. The minister of Education also stated in October 2006 that six years of mother-tongue education will be instituted at all schools (Rapport 2007). However, if it is true that six years teaching in the mother tongue is adequate as a foundation, the question arises why South African youth also count amongst the poorest readers in the world?

It was reported that businesses in South Africa first have to teach young recruits to read and write before the company can commence with their training programmes, indicating that basic skills are fundamental for
efficiency in any working environment (Rapport 2007). Furthermore, UNISA found that students need reading skills to comprehend mathematical texts and to access, learn and apply mathematical concepts. (Bohliman and Pretorius 2002: 196-205; Dale and Cuevas 1987: 9-54)

Despite the acknowledgement of the DoE regarding the reading problem, decision makers are still indecisive in effectively addressing the problem, leaving Higher Educational Institutions with a rapidly growing intake of students who struggle to read and write, contributing to the failure and dropout rates. The DoE mentioned that they did not focus sufficiently on the core competencies of literacy and numeracy and that they had made serious mistakes in relation to the language of learning and teaching to try to teach first year learners in a language they do not understand (Sunday Times 2008:10).

Bakwin and Bakwin (1972: 409) reported that since 1952 the percentages of children in American schools who were unable to read at their proper school grade level remained unchanged at 10% for 20 years. The reason for this is believed to be that most of them had a developmental defect in understanding the written word, but their potential for reading was normal but not fully utilized as an effect of poor motivation, limited stimulation, anxiety, negativism and emotional blocking.

Therefore, this paper addresses the controversial issue of improving the reading skills of learners through technology-assisted reading programmes. Many different arguments are heard in favour of or against computer-based reading programmes of which many argue that reading on a screen will not improve reading on paper and that screen reading is not a “normal way” of reading. On reporting the results of a group of learners who participated in a computer-reading programme for seven months, we shed some light on the value of computer-aided reading programmes and try to answer the question of whether such programmes should be embraced or avoided in our educational system.

2. Reading and computers in education

Bad readers avoid engagement with the written word, resulting in negative attitudes towards school and education. Most of the schools’ and teachers’ problems are rooted in the fact that learners cannot read. The lack of reading skills manifests in behaviour patterns that are not correctly interpreted by teachers as not being able to read but rather as misbehaving, being ill-mannered or even stupid (Wilsenach 2003: 96).

Many higher education institutions in South Africa progressed to technology-supported learning as many students who enter tertiary education are under-skilled and lacking basic academic and other related skills (Van Schalkwyk 2002:183-188). Should we not be more innovative in our school programmes in the face of a crisis and intervene quickly to learn from the experience?

Many educationalists still doubt the benefits of technology in fostering literacy skills and accordingly the lack of literacy skills and technological skills pose a higher risk for learners and students who enter the educational system of not achieving educational goals (Weikle and Hadadian 2003:181). However, according to the literature, assistive technology does not cure or eliminate learning difficulties but it helps a learner reaching his/her full potential as it utilises their strengths and allows them to bypass areas of difficulty (Stanberry and Raskind 2007:2). In this regard research has shown that assistive technology serves to improve certain skills deficits such as reading and spelling (Higgins and Raskind 1997:2). Moreover, the large storage and calculating capacities of the computer offer great potential for its use in the classroom. It can give instructions to the learner, call for responses, feed back the results and modify his further learning accordingly. The computer also can be used to measure each student's attainments and compare them with past performances.

In addressing reading difficulties, the choice of a suitable computer programme is one of the most important aspects. In search of the programme to be used, a set of criteria should be listed as minimum requirements to provide readers with the best chance for success. Such a programme should encompass all important aspects of reading but should also be able to assist the teacher in record keeping and administration.

Three basic levels of comprehension at least should be included in a reading programme for primary school learners as a minimum requirement, although comprehension of reading material requires much more than only three levels of comprehension.

- Comprehension of the factual content, which is important for studying. The learner must be able to recall important information and discriminate between important and less important information.
Comprehension on an interpretive level enables the learner to interpret the content. The learner needs to identify the main idea, make assumptions based on the content, provide possible information of future actions and draw conclusions regarding the moral or lessons to be learnt from the content.

Comprehension to analyse and apply the content. The reader needs to identify, from the content, similarities and differences, causes and effect and be able to reason and make decisions for application in general life scenarios. Readers also need to be confronted with the views of the writer that may be different from them to enable them to understand that you as a reader need not have to agree with what you read but can be stimulated to think in different ways.

A suitable programme should enlarge vocabulary and improve word recognition. This is important to enable the reader to recognise words quicker and to improve the reader’s ability to express himself verbally and in writing.

Different reading techniques should be introduced to improve reading speed, fluency of eye movements and to reduce the duration of fixation and to improve recognition span. Spelling is an integral part of written communication and an aspect of great concern at schools and tertiary education level and should, therefore, be part of such a computer programme.

3. Methodology

The study took place at an Afrikaans medium primary school in middle to lower income socio-economic environment. Letters were sent to all parents informing them of the proposed reading programme for grade two to seven learners. Learners could be assessed voluntarily at the school over a period of three days. In addition, teachers identified learners with reading barriers and specifically referred those learners for voluntarily assessment. A comprehensive report was compiled for every learner after the assessments were completed.

3.1 Subjects

The group consisted of 31 learners from grade 2 to grade 7. The number of respondents per grade is shown in table 1.

Table 1: Grades of participants

<table>
<thead>
<tr>
<th>Grade</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>4</td>
</tr>
<tr>
<td>Grade 3</td>
<td>5</td>
</tr>
<tr>
<td>Grade 4</td>
<td>4</td>
</tr>
<tr>
<td>Grade 5</td>
<td>8</td>
</tr>
<tr>
<td>Grade 6</td>
<td>7</td>
</tr>
<tr>
<td>Grade 7</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
</tr>
</tbody>
</table>

3.2 The assessment

A standardised scholastic reading test was utilised that provided information on reading speed, comprehension, vocabulary and typical reading mistakes. An additional standardised spelling test was used in order to also assess the spelling skills of the learners. The tracking of eye movements by means of moving a pencil horizontally and vertically and towards learners’ eyes, formed part of the assessment. Any irregular eye movements, discomfort or pain were noted, duly reported and recommendations for an appointment with an optometrist were made when necessary.

The electronic assessment was used as an introduction to the reading programme and to assess the learners’ mouse-skills. This was done to ensure that the lack of computer literacy of the learners would not impact negatively on their performance in the assessment (Foxcroft and Roodt 2005:183).

There are, however, many aspects that influence reading capabilities which are not always detectable in assessing reading through standardised reading tests. A reader who is inhibited if required to read aloud could be assessed through silent reading, which then does not allow for an assessment of fluency and accuracy (Lewkowics (n.d.):4). Furthermore, standardised reading assessments do not measure growth over a short period of time nor will it measure mastery of the reading task.
3.3 The electronic reading programme as intervention

The study spanned a period of seven months and the programme did not run during school holidays. All learners were placed on the programme with compulsory attendance for at least 16 sessions of 45 minutes each, after which a decision would be made for continuing on the programme. Learners started at different times during the seven month period.

A standard reading session throughout the seven month period contained the following elements:

- A spelling test, where the specific word is flashed and the learner is also able to hear the word through earphones. Flashing speed gradually increased with every session;
- Testing of reading speed;
  - A contained reading exercise to improve fluency and speed. The contained speed is initially determined by the comprehension achievement in the assessment of the first session. Should the reader attain 70% or above, the contained reading speed will increase at default of 10 words per minute in every subsequent study-unit. Should the reader attain below 70% for the comprehension test, the contained speed will be decreased for the start of the programme. Any achievement of below 70% on the comprehension test in the following sessions will result in the reading speed being contained. The contained reading exercises promoted the following aspects:
    - reduce the duration of fixation on a word;
    - improve the recognition span to eleven characters and train the eye to transgress into the margins rather than regress;
    - improve the fluency of the eye in moving from left to right.
- Comprehension test.
- Test of language skills.
- Paper-based activities to reinforce new vocabulary and the application of new knowledge in general language (learning through repetition).
- Five to seven minutes of engagement in electronic exercises for eye movement, visual accuracy and visual memory.

The following additional features were accommodated:

- Readers were encouraged to make use of the dictionary function of the computer programme for unfamiliar words.
- Readers were encouraged to listen to the reading material as read by mother tongue speakers.
- Readers could record themselves to enable them to assess their own progress.

3.4 Personal interventions as part of the programme

Health is regarded as a state of total physical, psychological and social well-being and not just as the absence of illness. Healthy perceptions of oneself and confidence in one’s own abilities form part of the total state of health. Literature informs us that achievement or failure is not only determined by ability, but also by a person's perception of his or her ability (Ochse 2003: 67-73). Many children perform poorly in school because of their low expectancies and feelings of hopelessness and not because they lack the intellectual capabilities (Graham 1989:40). Negative experiences in the classroom such as being teased by others, insensitive remarks from teachers and parents and learners compared against each other, contribute to the learner’s perceptions of their reading abilities. These perceptions cause poor readers’ dislike of reading and unwillingness to engage in reading activities. The poor reader feels exposed and humiliated when asked to read aloud, contributing to anxiety and poor confidence.

Competition in the classroom creates anxiety, while the lack of competition and being threatened by others motivates competition in itself. As every learner engages with the reading material on a computer and receives immediate feedback electronically, the competition between readers is eliminated but competing with oneself is encouraged.

Learners were encouraged to read softly with minimum movement of the head. They were also encouraged to read to their younger siblings, pets and dolls at home and to use their newly acquired vocabulary in their daily conversations. The facilitator provides techniques for the memory of the spelling of difficult words and provides continuous information on spelling rules. Help from the facilitator regarding unknown words not
provided by the dictionary function would be in the form of providing information about the word to enable the reader to think.

The atmosphere in the venue was kept informal, caring and non-threatening. Recognition formed an important part of the programme. The facilitator made an effort to recognise every reader at every session for something positive. News about the readers’ achievements was published monthly in the school’s newsletter and parents were provided with regular progress updates. Achievements to be recognised were not limited to reading achievements, but also behavioral achievements such as punctuality, neatness, friendliness etc.

Parents and teachers formed part of the reading team providing the support, encouragement and time the learners needed.

3.5 Evaluation

Continuous evaluation took place. The reader was offered immediate feedback on every response by means of an animated character. A report and graph is also presented at the end of an exercise and a full report at the end of every session provided readers with the results obtained during the session.

4. Results

The results of the assessment indicated major difficulties in the following areas:

- Poor reading speed
- Poor comprehension
- Fixation on specific words
- Rereading of words and phrases
- Poor vocabulary
- Difficulties in pronunciation
- Incorrect eye movements

In the following table the results of the learners after the completion of 15 reading sessions (study units) are reflected next to the results learners obtained in the initial assessment. The column Expected reading speed indicates the expected reading speed for every grade (Taylor, Frackenpohl and Pettee 1960). Reading speed is indicated as words per minute while comprehension and spelling are reflected as percentages obtained.
Table 2: Comparison of the results of the initial assessment and after completing 15 reading sessions.

<table>
<thead>
<tr>
<th>Grade</th>
<th>N</th>
<th>Expected Reading speed</th>
<th>Reading speed, wpm</th>
<th>Comprehension, %</th>
<th>Spelling, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Assessment</td>
<td>After 15 units</td>
<td>Assessment</td>
<td>After 15 units</td>
</tr>
<tr>
<td>Grade 2</td>
<td>4</td>
<td>115 w.p.m.</td>
<td>29</td>
<td>44</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>75</td>
<td>20</td>
<td>74</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>41</td>
<td>25</td>
<td>73</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>45</td>
<td>45</td>
<td>88</td>
<td>25</td>
</tr>
<tr>
<td>Grade 3</td>
<td>5</td>
<td>138 w.p.m.</td>
<td>32</td>
<td>77</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>97</td>
<td>60</td>
<td>82</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>144</td>
<td>60</td>
<td>94</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>68</td>
<td>63</td>
<td>66</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>90</td>
<td>60</td>
<td>84</td>
<td>20</td>
</tr>
<tr>
<td>Grade 4</td>
<td>4</td>
<td>158 w.p.m.</td>
<td>16</td>
<td>84</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>90</td>
<td>50</td>
<td>83</td>
<td>10</td>
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<td></td>
<td>33</td>
<td>101</td>
<td>13</td>
<td>92</td>
<td>10</td>
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<tr>
<td></td>
<td>52</td>
<td>108</td>
<td>13</td>
<td>91</td>
<td>70</td>
</tr>
<tr>
<td>Grade 5</td>
<td>8</td>
<td>173 w.p.m.</td>
<td>49</td>
<td>105</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>455</td>
<td>80</td>
<td>79</td>
<td>10</td>
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<tr>
<td></td>
<td>103</td>
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<td>50</td>
<td>63</td>
<td>40</td>
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<td>99</td>
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<td>91</td>
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<td>79</td>
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<td>51</td>
<td>135</td>
<td>50</td>
<td>72</td>
<td>30</td>
</tr>
<tr>
<td>Grade 6</td>
<td>7</td>
<td>185 w.p.m.</td>
<td>132</td>
<td>262</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>134</td>
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<td>84</td>
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<tr>
<td></td>
<td>91</td>
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<td></td>
<td>66</td>
<td>189</td>
<td>60</td>
<td>81</td>
<td>30</td>
</tr>
<tr>
<td>Grade 7</td>
<td>3</td>
<td>195 w.p.m.</td>
<td>167</td>
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Assessment results indicated that none of the learners met the expected level for their grades.

In the table below, the improved results of learners are reflected as per individual learner and as per average for every grade.
Table 3: Improved results per individual learner and per average for every grade

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<th>Gr.</th>
<th>Grade</th>
<th>Improved Reading Speed, w.p.m.</th>
<th>Average Reading Speed, w.p.m.</th>
<th>Improved Comprehension, %</th>
<th>Average Comprehension %</th>
<th>Improved Spelling %</th>
<th>Average Spelling %</th>
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5. Discussion of results

5.1 Reading speed and comprehension

According to the results, it is evident that the reading speed of all readers increased without exception. The improvement in reading speed and comprehension was unique to every learner. It seems that reading speed improved more rapidly in the grade 5 to grade 7 groups and that comprehension improved best in the grade 2 and 4 groups. Improvement in individual reading speed varies from as little as 11 words per minute to as much as 355 words per minute. The grade 5 average increase in reading speed is influenced by one learner’s exceptional improvement. This specific learner was extremely focused, dedicated and motivated by his own success and achievement. In order to gain a more realistic picture of the general increase in reading speed in the grade 5 group, the particular learner’s speed was omitted in the calculation – indicated within brackets. Two different results are also indicated in brackets in the grade 7 group where learners achieved exceptionally well.

Comprehension was maintained or improved despite an increase in reading speed. Only two learners in grade 5 showed an insignificant decline of 1% in comprehension. It can be assumed that the individual engagement with reading material allows every learner to improve according to his or her own pace, level of motivation, cognitive abilities and dedication to the reading programme.
5.2 Spelling

The spelling results in table 3 reflect the average mark every learner obtained for the 15 sessions attended. This average was compared against the mark obtained in the initial assessment. The spelling results were included as a matter of interest as the results indicate that spelling of the learners improved drastically after attending 15 reading sessions. Possible reasons could include the frequent exposure to new words, improved vocabulary, spelling exercises, paper-based repetitions and repetition of basic spelling rules and ways of remembering them. Improvement of spelling as part of a reading programme could be investigated.

5.3 Contributing factors

The individual attention to each learner, support from the teachers and parents are seen as contributing factors to the success of the learners in the group.

One group of learners, who was referred to an optometrist after the initial assessment, commenced on the programme with correctional glasses.

5.4 Benefits beyond reading improvement

5.4.1 Feedback from teachers and parents

The following feedback was received from parents

- Learners use newly learned words at home during conversations
- Learners asked for books from the library for the first time
- Learners reading for the first time during school holidays
- A general increase in school marks
- A change in attitude towards reading and excitement about the reading programme
- An improvement in reading speed and reading fluency
- Learners having fun reading to their pets

Teachers reported a general improvement in confidence especially from the shy learner and a general improvement in learners’ marks in unrelated subjects. The improvement in reading speed and fluency also was reported. Teachers felt confident enough of the benefits of the reading programme as they started referring learners and their parents to enroll in the programme. Thus, the motivation level is increased.

5.4.2 Facilitators’ experiences

Demotion of learners by the computer programme to a level where they are comfortable is an especially positive attribute. The moment the learner copes with the reading material and is able to achieve 70% or more for comprehension, their attitude towards reading changes. Learners become excited about their marks. They want to share their newly achieved success with their peers and parents and want to continue with the reading programme. The learners were motivated by their success and started asking for additional reading material on the computer. This phenomenon depicts collaborative learning.

Learners become helpful towards younger learners or learners in need of support. They started to refer their friends, whom they perceive as struggling with reading, to enroll in the programme. Social learning is enhanced in this regard.

Poor reading skills in the class label the learner as a member of the slow or dumb group. Being part of the reading programme now places them in an exclusive group who are privileged to read on the computer. This was very helpful for the poor readers in regaining their self-confidence and enabled them to use their disadvantage as an advantage in coping with the negative remarks from other learners.

The mouse skills of learners improved drastically, especially those of the grade two learners. The additional computer exercises not only improved visual memory and visual accuracy, but also improved hand-eye coordination. A dramatic improvement was noted within the third week of attendance, indicating a noticeable improvement in finer perceptual motor skills.

Confidence of readers grew rapidly as they proceed through the programme. The immediate feedback is a good motivator. The computer kept visible score of the learners progress during the programme which
Motivated readers to seriously consider different options before answering a question and so consciously try to improve their mark. The graph that is visually presented after completing the speed reading exercise was a favourite with all readers as they requested it to be printed and taken home.

![Graph](image)

**Figure 1:** Example of a graph of one of the learners.

The exercise on visual memory spontaneously developed into a competition for the readers. The readers took the initiative to type a list of all the group members and excitedly entered new readers. This competition served as a major tool in developing perseverance and goal setting as learners were unwilling to leave the room until they had achieved their goal for the day.

The visibility of the computers at the school resulted in many learners requesting to be part of the programme.

Negative experiences were limited to two aspects. Firstly, limitations in the design of the programme in that the facilitator has no access to the framework to rectify spelling mistakes and grammar related mistakes. Secondly, the limitation of the programme in allowing more than one correct response from the learner as the programme was not always able to confirm the accuracy of synonyms or antonyms. This resulted in correct and more creative responses from learners marked as incorrect by the programme.

6. Conclusion

The results of this study indicate the importance of adapting our teaching methods in order to address the reading crisis in the country. Computer-based reading programmes are effective and fairly quick in addressing the reading problems of young learners. The educationalists who still believe that reading on a computer screen is not the answer to addressing reading difficulties, should ask the question if we are in a position at all to waste time on debating the advantages of computer-assisted reading in South Africa. If our children are among the worst readers in the world, why not use computer-aided technology as the medium which young learners can identify with to cultivate and re-establish a love for reading?

This tool opens doors to interact with the world. Reading creates the opportunity to learn and therefore learners should be offered the opportunity to improve their reading skills. Computer-assisted reading programmes offer learners the opportunity that we as educationalists should embrace.

This paper is the first in a series of papers in addressing reading difficulties through computer-assistive programmes. Further research in the efficacy of specific programmes and the criteria such a programme should have as minimum requirements for the improvement of reading skills and to provide readers the best chance for success, is envisaged.

References


