From Student Work to Exemplary Educational Resources: the case of the CTER White Papers

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ABSTRACT Within the existing system of education, student work rarely has any value beyond the particular course that it is created for. The work is graded and then usually discarded. The authors describe in this article a way that student work can be systematically made available for use by others beyond the immediate learning context within which it is created. They provide a case study in which this mechanism worked. They describe the benefits and costs of doing this, along with the broader implications this systematic publication of exemplary student work might have for the changing relationship between learning and doing, between education and the rest of society. This publication mechanism, called OPEER (open publishing of exemplary educational resources), can enable education to have an additional major positive impact on the rest of society, creating and maintaining quality-assured resources at a minimal additional cost.

Introduction

At all levels of our current educational system, students produce work: homework, class reports and papers, tests, laboratory work, artistic work. However, unlike work in the world outside the educational system, most student work has no value beyond its demonstration of student learning, which is captured in a grade. Typically the student work itself is discarded after being evaluated, and only the evaluation is saved. That evaluation is typically a drastically reduced representation of the work, which has no value beyond the educational assessment.

Given the pervasiveness of our current 'school-based' educational system, this may seem unremarkable. However, it is remarkable given a broader view of education. Learning and doing are much more richly interconnected in many parts of society today outside the school-based educational system. In the past, learning and doing were more closely connected than is typical in a school-based system. New communication and computational technologies allow for new kinds of interactional frameworks that interconnect education more closely with the rest of the world.

In this article, we describe a framework that we have implemented and evaluated, as both an existence proof that such frameworks can be mutually beneficial to both the learners and to others and as an attempt to map out the space of possible interactional frameworks for interconnecting learning and doing.

Interconnecting Learning and Doing: three case studies

The three authors have been instructors for courses as part of CTER OnLine, an online Master of Education program in the College of Education at the University of Illinois, Urbana-Champaign. CTER OnLine is aimed at elementary and secondary education teachers with a focus on curriculum, technology, and educational reform (CTER). Approximately 25 students are admitted each year, and a student typically graduates in two years. The first students were admitted in June

1998 and graduated in May of 2000. Each CTER student takes eight online courses to earn a Master of Education degree.

As part of two different CTER courses, the authors helped students to create, edit, and update 'CTER White Papers on Technology Issues for Educators'. We describe here three different interactional frameworks that were used to support the creation and maintenance of these CTER White Papers. We evaluate their impact on both the learners who created them and on the world outside these classrooms. Finally we describe a general framework for embedding student work in the broader world outside of school-based education, allowing the world of education to serve as an important new resource for the world outside of education.

In the spring of 1999, the first cohort group of CTER students created seven CTER White Papers. Each White Paper focused on an important area of policy concern for the uses of technologies in education. These CTER White Papers on Technology Issues for Educators (http://LRS.ED.UIUC.EDU/wp) focused on the areas of:

- Access (Eck et al, 1999);
- Credibility & Web Evaluation (Greer et al, 1999);
- Free Speech vs. Censorship (Barber et al, 1999);
- Privacy (Bennett et al, 1999);
- Commercialism (Bogren et al, 1999);
- Intellectual Property, Copyright, & Plagiarism (McCarthy et al, 1999); and
- Computer Crime & Technology Misuse (Forness et al, 1999).

Strictly speaking these were not 'papers' at all, but websites that included student-drafted text on the dimensions of each issue, collections of web resources, and in some cases specific policy recommendations. The phrase 'White Paper' accords with the use of that term to signify a well-researched and documented text that has a significant bearing on policy issues. We remediated (Bolter & Grusin, 2000) the term for the Web. These White Papers were created by groups which were part of a CTER course, EPS 304 (described below), revised by a different set of students in another course, EdPsy 387 (also described below), and augmented by a third set of students in a later offering of EPS 304. These websites have been heavily used over the years since they have been created and they serve as prime examples of how student-created resources can serve as important contributions to the world outside of the classroom within which they were created.

How Were the White Papers Created?

Two of the authors (BCB & NCB) co-taught a course (Educational Policy Studies 304) 'Ethical and Policy Issues in Information Technologies' during the spring semester of 1999. This course addressed several of the major ethical and policy issues that are changing the ways we think about new information and communication technologies in schools (including primarily, but not only, computers and the Internet). The class discussions continually pushed up against two kinds of barriers: one, what is 'realistic' to expect of schools and the people who live and work in them; the other, the conventional, 'easy' understandings of these issues and the need to challenge common-sense truisms that may obscure deeper, more complex and difficult issues. The course emphasized contexts that are familiar to teachers. While the class involved reflection on broader issues of principle, how ethical positions are to be justified, and other philosophical concerns, these were continually brought back to cases that are of immediate relevance to the daily lives of schools. Because this was a technology-oriented class, we also reflected on our own uses of these technologies as the class proceeded. Issues such as evaluating the credibility of website information, privacy, and so on, arose within the class as well as in the readings and lectures for the class. The final key element of the course was a project orientation. Teams worked all semester on a culminating project. Teams worked mostly independently of one another, and needed to collaborate effectively for their team projects to succeed. Learning to work effectively in such teams, and using technologies to facilitate such collaboration, was a major goal of the course as well.

The central project for each team was to produce one of seven White Papers, which would present the major issues surrounding each of these areas of controversy, to frame and explain a range of views about each issue, and to explore the reasons and ethical assumptions behind these

different views. These papers were accompanied by an annotated bibliography of web resources on each issue (for which the suggested resources from the class readings and bibliography are just starting points). Each White Paper was published on the Web, and intended to constitute a major resource for educators all around the world seeking a better understanding of these issues and their educational implications. Because of the broader purposes of the CTER program, the innovative use of technology in teaching and the promotion of critical reflection about the technologies we use in the program are part and parcel of the program itself. The technologies are not conceived as a 'delivery system' for course content. The 'White Paper' project incorporated several ideas that are important to the overall design of the CTER program.

The first is the importance of group projects. Many teachers are too isolated in their work roles and do not come to regard fellow teachers as in any deep sense of the term 'colleagues'. So for us, collaborating together became a central requirement in the course, something students needed to learn how to do, and something that did not come easily to them. Students worked on these White Paper projects together, and they knew that they would share the final grade. This grading policy frequently raises a discussion about whether it is fair, and what happens if not all members of a team contribute to the final project 'equally' (whatever that means) – which in turn opens up discussion about the nature of collaboration, and the various ways in which group members can contribute to the effectiveness of an overall effort even when their contributions may not look exactly the same. It also frequently opens up a discussion about grading itself. But to be frank, nearly every class section has included at least one team with a member who goes AWOL. This problem opens up opportunities for the students to engage in critical reflection about whether the shared-grade approach is fair and how they as teachers can foster the development of collaboration skills in inherently competitive contexts.

A second key idea behind the White Paper approach involves collaboration that goes beyond the immediate context of a particular course. In the very first meeting we told students that their projects would be posted as web pages; it was an online course so we thought their research and writing should be online as well. This decision had repercussions beyond anything we ever imagined. First, the teams became very motivated: most class assignments are only ever seen by two people, the student who writes it and the instructor who grades and returns it. Normally, its work is considered to be done at this stage: whether it gets filed, thrown away, or stuck on a refrigerator, the cycle of production/evaluation/feedback has been closed. But when students know that their work will be permanently posted, publicized, and available for hundreds or thousands of other educators to see, the value and purpose of the project (beyond earning a grade or satisfying the instructor) become much more salient to the students working on it. These CTER White Papers have become the best single resources anywhere on the Web in synthesizing and explaining these issues for educators: they have been accessed tens of thousands of times, and they are linked to by a variety of general websites for K-12 educators (i.e. educators in compulsory education). The students have been justly proud of their creations.

How Were They Revised?

During June of 2002, one of the authors (JAL) taught a course (Educational Psychology 387) 'Computer Uses in Education' to a new set of CTER OnLine students. This course is a broad introduction to technology uses in education. In past versions of this course, students were asked to read the CTER White Papers and individually comment on them. One of the most common comments in semesters before the summer of 2002 focused on the large number of broken links in the White Papers.

In this version of the course, the class was divided up into seven groups by the instructor, and each group was asked to revise a specific White Paper. Each group was asked to check each link in the White Paper they were assigned, and for each broken link, either fix it or delete it. Each group was also asked to add at least one new link to the White Paper. Finally, each group was asked to write up a list of suggestions for more major improvements for the White Paper. For this course, this 'White Paper' assignment was a relatively minor part of the overall course, equivalent to one week in a 15-week semester.

The revised White Papers were then posted in place of the original White Paper, with each still listing the original authors and each having an additional 'Edited by …' line listing the students who revised the White Paper (Altenbaumer et al, 2002; J. Brown et al, 2002; M. Brown et al, 2002; Dieken et al, 2002; Drew et al, 2002; Eder et al, 2002; Shore et al, 2002).

The combined set of suggestions was sent on to the instructor of EPS 304 (described below), who sent it electronically to the students of his course, which started right after this EdPsy 387 course ended. These EPS 304 students were asked to create more substantial 'addenda' to the White Papers.

How Were They Expanded?

During July 2002, one of the authors (NCB) taught a course (Educational Policy Studies 304) 'Ethical & Policy Issues in Information Technologies' as the last course taken by a group of CTER OnLine students. The students in this seminar were divided into seven groups, and each group was asked to write an 'addendum' to an assigned CTER White Paper, to cover gaps found in the original White Paper. In some cases these gaps were new topics that evolved over the intervening years; in other cases the gaps were areas that the original White Papers did not cover or covered only briefly. The students were given the suggestions from the EdPsy 387 students, but were also encouraged to critically read the White Papers and find gaps and areas for improvement. The CTER White Paper Addenda were discussed in the seminar, evaluated by the instructor, and then electronically published, interlinked with the White Papers. Feedback from the authors of the original White Papers was incorporated into the White Paper Addenda.

The CTER White Papers served several roles in this seminar. CTER students have used these web resources for two kinds of purposes: (1) as curriculum content, in orienting them to the ethical and policy issues that this seminar and other courses in the program want them to think about; and (2) as raw material for their own group projects, evaluating the pages for design and content, updating them (fixing dead links, and so on), developing new appendices to supplement them, and in some cases questioning or going beyond those pages to examine further related concerns that may have arisen since those pages were first created (the website contains both the original and the corrected and supplemented versions). Here again, further questions arose about collaboration and the way in which the Internet comprises regions of shared or distributed knowledge: Whose names go on which versions? How does a link between A and B create an implied association between them? Can people be held accountable for views that they are associated with, but which may not reflect their own beliefs? When is a class project 'finished', and is there any reason to think it needs to be 'finished', within and across different sections of the course?

Impact of the CTER White Papers on Student Learning

First we might ask what impact these White Papers had on student learning. If they do not have a positive impact on student learning, it would be difficult to justify their use in a course, even if they had secondary benefits.

At the end of the two-year Master's program (and one year after they had created the White Papers), students were asked to fill out a questionnaire. One of the questions was 'What was your most memorable experience in the CTER OnLine program?' Several of the students mentioned the CTER White Papers in their exit questionnaires. For example, one student said, 'I loved doing and reading the White Pages.' This positive response called for a deeper analysis of the effects.

To gain further insight into the impact of the White Papers, in the fall of 2004 separate email questions were sent to each of the three cohorts of former CTER students involved in creating and updating the White Papers. While responses are still coming in, here are some of the things that the former students in each cohort had to say.

For the first cohort (CTER1), this question arrived four and half years after they had created the papers. They were asked, 'What impact has writing the CTER White Papers in EPS 304 in Spring 1999 had on you, either positive or negative?' One CTER1 alumnus responded:

> I had never really thought much about the world of computer security until I had opportunity to
> delve into the white paper project. I learned a huge amount regarding areas ranging from

Acceptable Use Policies and online harassment to more technologically-based things such as computer viruses, hacking, and software piracy. The opportunity to work with a number of other students was very important and satisfying. It personalized the project and added to the feeling of unity that pervaded the interactions of the CTER 1s throughout the program.

Another CTER1 alumnus said:

I have used the white papers from our class to refer to for projects that I am working on. Once in awhile I need to check on facts that we documented and I know right where to go. I have also given the URL to others that have requested information that I know can be found in our papers.

The CTER5 cohort did minor editing of the CTER White Papers during the first part of the summer of 2002, more than two years previous to receiving the question. They were asked 'What impact has editing the CTER White Papers in EdPsy 387 in Summer 2002 had on you, either positive or negative?' One CTER5 alumnus explained:

It was interesting editing the CTER White Papers. I worked on the paper on credibility and web evaluation. My name was listed on the first page of the paper as last modified by, and because of this I have been contacted a couple of times in the past about the paper. Most recently from a Technology Coordinator in Texas that wanted to use some of the information for a newsletter to her local technology people in the corporation.

Another CTER5 alumnus said:

I do believe the impact was positive. When I was teaching first grade the students didn't use the Internet as much, but now that I am teaching fourth grade, I see the impact of the White Papers. My students use the computer much more and will be using the Internet for projects. Looking and editing the White Papers was very beneficial.

A third explained:

I think it made me want to know more about the issues raised. Rather than just reading about them, I was able to research the idea further. It made me think about where I stood more than I would have.

The CTER4 cohort created addenda to the CTER White Papers during the second part of the summer of 2002. They were asked, 'What impact has writing the CTER White Paper Addendum in EPS 304 in Summer 2002 had on you, either positive or negative?' A CTER4 alumnus responded:

Well, the White paper did have an impact on me as I still have it bookmarked and refer to it often in my teaching in the fall and in the spring (supervising student teachers/lang arts methods). Not only was it important for me to understand the definition of terms surrounding this issue, the process of creating the website was a true collaborative effort. I learned not only the scope of the issue in schools today but how to work with colleagues from a distance. We met by email, by phone, and by chatting online. Deadlines were met: each member of the group completed tasks on our group generated time line. I have never worked in a group in which each member was so dedicated. This feeling has stuck with me these past years.

Another explained:

I wrote the addendum to Enforcing the AUP and Worms, DDoS and Cyber-Terrorism. Links are: http://lrs.ed.uiuc.edu/wp/crime-2002/viruses.htm and http://lrs.ed.uiuc.edu/wp/crime-2002/aup.htm. Writing both papers had a very active role in shaping my current view of how difficult it is to enforce web security at the government, corporate and institutional level, and how important it is to be vigilant on these issues. It also has brought me to a greater understanding of the legalities behind the AUP process. I would like to revisit the cyber-terrorism issue now and see what new information and security measures have been put in place since the Patriot Act was drafted. I really enjoyed researching and writing both papers. I am proud of the job I did and have linked them to my web site at work.

There are certain recurring themes in the responses of these CTER alumni. Three themes occurred in three of these responses. Three alumni mentioned that working on the CTER White Papers led to deeper learning on their own parts. This was the primary goal of the White Paper project. Three mentioned that they themselves used the White Papers afterwards, and three mentioned that they

directed others to use them. This supports the notion that these CTER White Papers had an impact beyond the scope of the class, in this case by the CTER alumni themselves and their colleagues. Two mentioned the value of intensive work in groups on the White Papers – that the group nature of this project had value beyond the nature of what the groups were working on. The broader impact of the CTER White Papers is reinforced by the fact that one alumnus mentioned a degree of 'fame' that he received from working on the White Papers.

**Impact of the CTER White Papers beyond
the Context in Which They Were Created**

Quantitative Measures of Wider Impact

The White Papers were published and publicized on the Web in September 1999, and soon there were about 5000 accesses per month, a small number but a substantial one for scholarly papers on relatively specific topics. Even at this early stage, most of the accesses (83%) came from outside the university in which they were created. Access continued at about that level for the rest of the 1999-2000 academic year. There was a substantial increase the next academic year, which continued through that year (2000-01) and the following year (2001-02). During the summer of 2002, the papers were revised and addenda created, which led to another doubling of the access rate during the 2002-03 academic year (with 99% of the accesses from outside the university in which they were created, and with accesses from 73 different countries around the world).

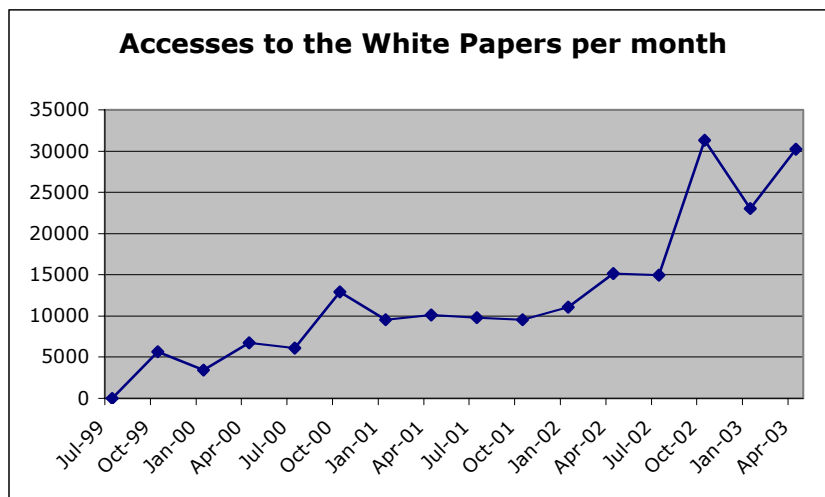The detailed analyses of the web logs of the White Paper website are available at http://lrs.ed.uiuc.edu/wp/about/accesses/

Figure 1. Graph showing accesses to White Papers by month.

Qualitative Measures of Wider Impact

Shortly after the CTER White Papers were electronically published in September 1999, they were mentioned in a widely circulated listserv called 'Net-happening', and they were linked from a widely used web portal established by Classroom Connect. These were probably important in the initial surge of accesses, since this was before web search engines were so widely used.

The CTER White Papers are linked from the National Science Digital Library Report for Math, Engineering, and Technology (13 September 2002). Recently, the CTER White Papers were included in a list of 'indispensable resources for educational technology professionals' in the May 2004 issue of the International Society for Technology in Education's *Learning & Leading with Technology* journal in an article titled 'Sine qua non: indispensable resources for ed tech professionals' (Conley, 2004).

Inclusion on each of these 'exemplary resource' lists provides some measure of the impact of these CTER White Papers on the world beyond the classrooms in which they were created, edited and augmented.

Open Publishing of Exemplary Educational Resources

The CTER White Papers described here can be generalized in a framework that could be incorporated into education more broadly, the open publishing of exemplary educational resources (OPEER). Most student work, even today, is treated as an exercise, an activity to support learning but with little or no value beyond the particular class that it is part of. In exceptional circumstances, student work might be used beyond the class, but that was a rare exception.

New educational media, especially the Web, make it easy, fast and inexpensive to electronically publish resources. In fact, one of the weaknesses of the Web is that it is so easy to publish things that it is becoming harder and harder to identify the useful web resources from among the rapidly increasing number of overall web resources. So while it is relatively easy to electronically publish all student work in a course on the Web, the value of that to the world outside of education would be limited, because of the effort it would take to locate the useful from the larger amount that isn't useful.

There have been many attempts to create collections of useful resources on the Web, but many fail because of the high cost of creating and maintaining the resources. It is relatively easy to collect large numbers of contributions, but costly (in time, at least) to go through those contributions and select the smaller set of useful ones. And once a collection has been created, it is costly to maintain that collection, given the dynamic state of the Web. Web links are subject to 'link rot'. The number of broken links in any web collection increases with time, as web resources are moved or disappear. New resources appear daily, so if a web collection is not updated, it becomes increasingly outdated since it fails to include the new resources.

The CTER White Papers are an instance of a more general framework that deals with both the selection and the maintenance problems. Any resource created by students as part of a course has a built-in evaluation mechanism – it is 'graded' by the course instructor. So, a very simple framework for building a growing yet quality-controlled web resource is to electronically publish only 'exemplary' student work. What work is exemplary? That decision can be made by the course instructor based on their built-in evaluations of the course, the grading of student work.

How to keep these OPEER collections up to date? Another obvious characteristic of courses is that they are usually taught again and again. Students who take the course in later years can, as a course assignment, review and revise the resources created by previous students, as a preliminary step to creating new resources of their own. With the CTER White Papers, we see that this review and revision activity can cross over from one course to another. While it made sense to create the CTER White Papers as a major project in the Educational Policy Studies course, it would not have been appropriate in the introduction to computer use course. But incorporating as a minor project the review and minor revision of the White Papers made perfect sense in the introductory course.

In an ideal teaching environment, projects and papers would be submitted electronically and then evaluated by the course instructor electronically. Once this is the case (which, given 'learning management systems' like *WebCT* or *Blackboard*, is increasingly the case), then the electronic publishing of those evaluated as exemplary could take place relatively automatically. The course instructor would set his/her threshold for what he/she thinks is exemplary, and then the course environment software would make those resources that are evaluated/graded as surpassing that threshold available to the world outside of the class.

New educational media such as the Web are seen as valuable because they make the resources of the world outside of the educational system available to students and teachers. Perhaps of more value still is the fact that these new media make the resources created by students and teachers available to the world more generally.

This OPEER framework is scalable and sustainable. Let's try to estimate the potential growth rate of these resources. Let's be pessimistic and assume for the moment that only one student resource would be judged exemplary by an instructor per course per semester, instead of the seven resources described here as the CTER White Papers. In the College of Education at the University

of Illinois, there are approximately 150 courses offered each semester. So if every course contributed to this OPEER framework and there were few as one exemplary resource per class, then there would be 300 new resources every year. However, the College of Education is only a small part of the overall campus of the University of Illinois at Urbana-Champaign. UIUC offers approximately 3000 courses every semester. So if these courses contributed to the OPEER framework, then the resources would grow much faster each semester. UIUC is only one of approximately 4000 institutions of higher education in the United States (Carnegie Foundation for the Advancement of Teaching, 2003). While many of these institutions are smaller in size than UIUC, it is still true that if many of these institutions were involved in creating and maintaining exemplary educational resources, these resources would grow at a very rapid rate. There are, of course, many institutions of higher education outside of the USA, and most are connected to the Internet, so involving these institutions would not only increase the scale of the OPEER knowledge base but would bring in a valuable range of different perspectives. Finally, there is no good reason to restrict participation in OPEER to higher education – many pre-college classes involve students in creating electronic resources and some of those resources are exemplary as well and bring yet different perspectives to the resource collection. The OPEER set would continue to grow and be maintained year after year, since courses are offered repeatedly year after year.

Currently the knowledge building in our society takes place through 'peer review', where fellow researchers are selected to review proposed additions to the knowledge base and where a subset of proposed additions are selected to be published. We describe here an alternative review mechanism, which might be called OPEER review, in which instructors grade student-created resources, and electronically publish those resources that are above an instructor-set threshold. For this to work on a large scale, students would need to agree to a standard open copyright policy, allowing free use of their published resources with the provision that their authorship be maintained through any revision of the resources, and will free use allowed for any revision under the same policy. Creative Commons (2003) is one source of an open license for online materials, which is currently the license that applies to the CTER White Papers website (2003).

The advantage of the OPEER approach is not just that it creates an ever-increasing set of resources. That has been happening on the Web ever since it was created. There are two main advantages beyond normal web publishing: quality control and quality maintenance.

Scalable Quality Control

One main advantage is that the OPEER approach creates an ever-increasing set of exemplary resources, where 'exemplary' is determined by someone who has expertise in the domain of the resources. One of the values added by the publishing industry is that it serves a quality control function. If everyone who wanted to could publish a book or an article, then the burden of selection would be shifted to the reader. This is what has happened on the Web – one of the most valuable things about the Web is that anyone can publish web pages; one of the worst things about the Web is that anyone can publish web pages. The OPEER framework makes only those student-created resources that are judged to be exemplary available to a broader audience outside of the specific content within which the resources are created. This does not serve as a censorship control – students who create resources that are not judged as exemplary are free to publish them on the Web on their own. But the OPEER resources provide at least some level of editorial evaluation and selection.

The advantage of OPEER is that it provides this editorial selection at nearly a zero additional cost. Student work is evaluated as part of the normal function of the educational system. Student work is increasingly submitted electronically, often into a course management system of some sort. Many universities have already created electronic publication systems (for example, the University of California's eScholarship system). Creating an overall system in which course instructors set a publishing threshold, in which students are asked to sign copyright permission, and in which exemplary student work is automatically published into the educational publishing system would be relatively easy.

One major question is whether the evaluation process that instructors use to assign course grades is similar enough to the process that users of these resources would demand. That is, would

users of information resources in economics, for example, be interested in the exemplary resources developed by students in economics courses? In general, this question may be answerable only by carrying out more pilot experiments similar to those described above, but at least in the case of the CTER White Papers, people interested in the domain of technology and education have found the exemplary resources created by the CTER students to be worth accessing.

Quality Maintenance

A second advantage is that it encourages for quality maintenance. Most of the existing exemplary resources on the Web were created by a person or group that put substantial effort into creating them. However, many exemplary web resources lose their value over time, either because the domain changes or the Web changes. The major complaint we got in 2002 about the original CTER White Papers created in 1998 was that they did not include new information, that links were broken, and that some information was outdated. It is often harder to maintain a web resource than it is to create it.

One of the features of the educational system is that the same course is usually offered over and over again at any one institution, and that very similar courses are offered at different educational institutions. So the same 'Introduction to Chemistry' course is offered every year at a given university and a very similar course is offered at other universities and colleges. In the case study presented here, the Computer Uses in Education seminar was taught each year to a new set of CTER students. This repetition provides a natural mechanism for reviewing periodically web resources, primarily as an aid to learning but secondarily as a quality review process. It made educational sense for the students in the Computer Uses in Education course to read the CTER White Papers as part of the course goals. The students were asked to take on the more active editorial task of identifying and fixing broken links and of adding a new resource. This editorial orientation provided a more motivating context for more active learning.

The same repetition occurred with the Ethical and Policy Issues in Information Technologies seminar, which is also taught each year to a new group of CTER students. In this case the CTER White Papers represented a more central place in the course, and so asking students to create the White Papers in one year and asking new students to extend the White Papers in a later year fits well into the instructional goals of the seminar. Again, the primary goal was to help students in the seminar learn; the provision of valuable information resources to others outside the seminar was a secondary goal. However, the secondary goal provided a motivating context for what would otherwise be just a classroom exercise.

As with any attempt to achieve multiple goals, the faculty members leading these seminars had to be careful not to let the secondary goals interfere with the primary goal, which was for students in the seminars to learn. We certainly can imagine implementations of the OPEER framework in which the secondary goal became so dominant as to hinder student learning. Given a conflict between these two goals, the instructors involved in the cases described here (the authors) would have suspended the pursuit of the secondary goal (the creation and maintenance of resources useful for people outside the seminar) if that pursuit hindered the primary goal of student learning.

In addition, creating information resources as a secondary goal may not produce as high-quality resources overall as efforts that have it as a primary goal. However, the quality control mechanism built into the OPEER framework (the publication of only that student work judged by the instructor to be exemplary) can insure that what is published is comparable with (or exceeds) resources created and maintained by people who have the creation and maintenance of those resources as their primary goal.

One faculty member who heard about this framework responded, 'My students never create anything that would be of interest to anyone outside my courses.' We were somewhat taken aback by his position, and privately wondered why this faculty member had chosen a career of teaching given such a pessimistic view of students and their abilities. While we certainly agree that all student work would not be of interest to people beyond the learning context, we also have found that in almost every course we've ever taught, some students or groups of students are able to develop resources that are of value beyond the immediate learning context. In this article, we have

described our explorations of contexts for harnessing these resources, for encouraging the transition of student work into exemplary information resources, and we are encouraged by the initial results of these explorations.

Summary

In this article, we examine the relationships between learning and doing, between education and the rest of society. In specific, we look at student work and how it can become a resource for the rest of society when embedded in an interactional framework that provides mutual benefit for all participants. We presented a case study of the creation and maintenance of the CTER White Papers, resources created by and for K-12 teachers interested in the ethical and policies issues concerning the use of new technologies for learning and teaching. This case study showed a way that new media allow for new ways to interconnect education with the rest of society, a way that student work can lead to exemplary information resources valued by people outside of the specific context in which they were created. We describe several ways in which student work can create, maintain and extend such exemplary resources. Finally, we generalized this case study, proposing a framework for systematically publishing exemplary student work to make it available more widely. By using new communication and computational media, the educational system can provide substantial additional value to the rest of society at a minimal additional cost. Embedding more of student learning in the broader context of society outside the educational system can be both more motivating and more effective than conventional student work seen solely as class exercises.

Acknowledgements

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