Handbook of Research on Socio-Technical Design and Social Networking Systems

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Chapter XLIX
Teaching the Socio-Technical Practices of Tomorrow Today

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ABSTRACT

This chapter explores the challenges associated with teaching the principles of socio-technical systems in the dynamic climate that characterizes work in today's—and tomorrow's—world. Avoiding a "socio-technical gap" involves preparing the designers of tomorrow in such a way that they can anticipate society's future needs and technology's future potential and prospective peril. By way of a narrative that draws on the author's own experiences teaching social informatics (SI) as part of an information studies degree program, this chapter discuss how her own research perspective in relation to socio-technical and social networking systems co-evolves with the classroom experience. The case study offers examples of tutorial activities and assessments to illustrate how the suggested approach to teaching and learning can be applied in an STS classroom.

Habits are useful but they can also be deadly. They are useful when the conditions in which they work are predictable and stable. But what happens if and when the bottom falls out of the stable social world in and for which we learn? Is it possible that learning itself—learning as we have come to enact it habitually—may no longer be particularly useful? Could it be that the very habits that have served us so well in stable times might actually become impediments to social success, even to social survival?

—McWilliam, 2005, pp 2

INTRODUCTION

Our 21st century existence is highly mediated and digitised. Social responses to what seems like an ever increasing rate of technological change range from the dystopian to the utopian—with a very rich and diverse middle ground. The modern digital landscape is under constant transformation.

Consequently the educational programs needed to equip future designers of the socio-technical systems required in such a world are undergoing a transformation of their own. Handling the complexity of social interaction and technological innovation is increasingly multidisciplinary in principle as well as in practice. Training on specific tools and applications is swiftly out of date (e.g.: Bawden et al, 2007; Hartman et al. 2005).

Understanding the social realm is equally challenging given the diversity and complexity of social engagements in this landscape. Thus navigators of this terrain need to be able to respond quickly to change. To be truly successful as a designer of such worlds, however, an individual must also be able to quickly appreciate the multiple perspectives in existence and proactively devise tools to help others make sense of it. Thus, the demands placed on educators in the field of socio-technical design move well beyond teaching about tools and applications for designing solutions to today's problems. The dynamism and complexity characterising the working world our students will enter means we need to prepare them to innovate, anticipate and imagine what might emerge.

This chapter explores the challenges associated with teaching the principles of socio-technical systems in the dynamic climate that characterises work in today's—and tomorrow's—world. Avoiding a "socio-technical gap" involves preparing the designers of tomorrow in such a way that they can anticipate society's future needs and technology's future potential and prospective peril. By way of a narrative that draws on the author's own experiences teaching social informatics (SI) as part of an information studies degree program, this chapter discuss how her own research perspective in relation to socio-technical and social networking systems co-evolves with the classroom experience. Thematically this topic relates to Social Informatics, eLearning practices and education research.

CHALLENGES FACING TEACHERS OF SOCIO-TECHNICAL COURSES

Teaching practices associated with the education of students in the area of socio-technical design and social networking systems challenge both the teachers and the learners to move beyond conventional analytical/creative dichotomies. The pace of change is such that whatever we are teaching about design and socio-technical systems today is likely to be overrun by outcomes in research and practice by the time our students enter the workforce. With the rapidity of change in digital environments, graduates are increasingly called upon to devise imaginative solutions to organisational and social challenges.

Social computing and Web2.0 developments are recent illustrations of the rapidity with which the landscape is changing. Working in these industries requires analytical techniques for identifying and evaluating social consequences of design and implementation. In addition to technical know-how, it requires imaginative problem-solving. The successful professional in these industries is one capable of adapting to change because the rate of change will quicken, not slow. Thus, it is highly unlikely that students could ever hope to receive all the technical know-how that might be expected of them in these industries. A glance through job advertisements in any part of the world amplifies what is being reported in studies of the job market and university training (see for example: Bawden, 2007, Grant, 2007; Clayton-Pedersen, 2005; Kling et al, 2005; McWilliam, 2005). While an awareness of technical elements is still important, other qualities characteristic of innovators must also be valued: creativity, imagination, curiosity, networking and communication skills. These trends suggest that those who will flourish in this environment are those who don't necessarily have a mastery of particular tools or systems, but rather a capacity for lifelong learning.

Are such environments becoming the domain of the 'generalist' who possesses some adaptable 'specialist' skills (acquired while in a degree pro-

gram)—but who, more importantly, has developed the techniques that will enable her to learn on the job? At the very least, it appears that a more trans-disciplinary approach is called for: one that values multiple perspectives, collaborative and imaginative approaches to problem-solving; one that appreciates the complexity of human-machine relations and the blurring of the boundaries between technical/social, public/private, old/new. Intellectual agility is increasingly in demand in the work force. In many ways, the new social computing tools of Web 2.0 environments make it even easier to find ways to think of curriculum as units to be taught as well as tools for teaching (see for example: Bawden et al, 2007). But we are not limited to these digital environments alone when devising curriculum that is relevant to preparing students for work in and with socio-technical design. Diversity and ubiquity characterise our socio-technical spaces.

For those teaching socio-technical courses, then, there is the constant challenge of devising curriculum that prepares students for the ubiquity of our socio-technical connections and the fast pace of change in digital environments. Take the following opening statement on the O'Reilly2007 ETech website (http://conferences.oreillynet.com/etech/) as an example:

... Technology is so tightly woven into our lives that at times we scarcely notice it. And yet, there are innovators, hackers, and thinkers plotting revolutions—often by simply reexamining underlying assumptions we already take for granted. From the infrastructure supporting mass-market players, the promise of mass computing, and alternative energy sources to personalized medicine, movie magic, web heresies, and talking paper, ETech 2007 explores the technological rejiggering and changes in perspective that are poised to blast off into the realm of magic.

The reference to "magic" and the wonder of things yet to be imagined suggests that in addition to being adaptive to change, a sense of adventure is also likely to become a powerful asset. This sense of wonderment was a core element of the approach to teaching and learning described in this chapter—and, as will be argued in this paper, is a worthy addition to programs aimed at teaching the socio-technical principles needed in tomorrow's world to the students we face today.

A CASE STUDY OF TEACHING ABOUT SOCIO-TECHNICAL ISSUES

Trends in education generally point to the need for new pedagogies to address the demands of living and working in a highly mediated, diverse society (see for example: Clayton-Pedersen, 2005; Hartman et al, 2005). Experience in Australia, for instance, draws attention to the fact that Australian employers highly value the portability of qualifications (e.g.: Learning Futures, 2007; MyCyberTwin, 2007). We will have to assist our students to become capable of transporting their knowledge and skills from one context to another. If our degree programs are to continue to be relevant to students, we need to create imaginative and stimulating learning environments while also ensuring the employability of our graduates. Such trends have even more significance for STS education which must confront the socio-technical challenges of constant innovation and growing social and technical complexity head-on. To this already challenging mix we must also add the need to learn to work effectively in teams and to collaborate in diverse and often online environments. Engaging with the socio-technical character of our dynamic world of networked information systems and social software requires students to respond laterally and imaginatively to matters that they are likely to encounter in the context of their future work roles.

The case study described here (a unit called *Social Informatics*) is part of the core in an undergraduate degree in information and media. Collectively six core units prepare students for work in the area of socio-technical design. The aim of this case study unit is to provide an opportunity for learning first hand about the issues raised within the

area broadly described as *Social Informatics* (SI) by initially introducing students to the principles of knowledge construction in various socio-technical contexts. SI places great emphasis on developing understanding of the social design of information and communication technologies (ICTs) (Kling et al, 2005; Lamb & Sawyer, 2005). The unit does not focus on tools, but rather on human practices informed by and informing the design, implementation and use of technologies.

The unit was designed to educate information professionals to be able to work in modern information environments by employing creative problem solving skills, lateral and creative responses to work tasks, and developing a range of skills and responses needed for exploratory approaches to networked environments. It sought to provide a setting for learning as a life experience based on practices which integrate creative and analytical skills as well as academic and personal experiences. The unit did not involve hands on design, but rather was created to complement the suite of design practice and theory units students take as part of their degree program. As an elective unit for students in other parts of the university, however, it attracts students from Information Technology, Engineering and Humanities & Social Sciences programs more widely. This mix of student experience is also integrated into the trans-disciplinary curriculum development of the unit, providing an opportunity to tease out the different perspectives each student brings to studying the relationships between information and communications technologies and the larger social context in which these technologies exist.

The case study described in this chapter illustrates how the principles of *social informatics* were used to inform not only the content of a unit on this theme, but also the teaching and learning strategies used to deliver that content. Social informatics (SI) is, in the words of one of the key figures associated with this approach, Robert Kling:

the interdisciplinary study of the design, uses and consequences of information technologies that takes into account their interaction with institutional and cultural context. (Kling, 1999)

Social informatics is a relatively new component of information science education, building on the activities of SI researchers in Europe, US and Australia. SI researchers are interested in questions about the future consequences of IT developments. The principles of social design associated with SI place emphasis on designing with consideration for the heterogeneity of uses, people, contexts and data. Moreover, it is an iterative process that should not end with implementation (Kling et al, 2005, esp. Chapter 3). To prepare students for such design practice, the unit in this case study centres on teaching alternative ways of working with technologies. It takes a trans-disciplinary perspective premised on a view that ideas are promoted by fluid and converging practices supported by modern technologies. Implicit in any definition of 'socio-technical' that we might use is an appreciation of the relationship between people (individually and collectively), technology and the construction of knowledge. This chapter suggests that the lessons learned in the designing of this particular unit can contribute to the curriculum developments of a range of units/subjects that might fall under the broad umbrella of educational programs in the area of 'socio-technical design'.

In addition to the field of SI (e.g.: Kling et al, 2005; Lamb & Sawyer, 2005), developments in the classroom under discussion in this paper draw on the author's own research and experimentation with the creative analytic approach of researchers like Laurel Richardson (2000) and Clandinin and Connelly (2000) and by taking this creative analytic approach further by bringing into the classroom Noel Gough's (2004) "speculative fiction" work. It also draws on research into the roles of electronic texts in the humanities, which suggests a move from an analytical academic style of writing to combinations of creative and academic styles. Some other important sources of curriculum development are found within studies of affect and emotion (Kaluzniacky, 2004) as well as the social studies of technology and scholarship of teaching and learning (e.g.: O'Sullivan, et al, 2002).

Underpinning the unit's curriculum is an interest in fostering students' creativity and lateral thinking

in ways which put SI principles into practice. The aim is to foster innovative solutions to socio-technical dilemmas. Work in tutorials and assessment is designed to engage students' creativity as well as analytical skills. The curriculum makes active use of online collaboration activities as a way of getting students to experience first-hand the strengths and weaknesses of communication and information systems available to them at the time of their study. They also engage in critical examinations of technologies considered to be "emerging" at the time of their participation in the unit.

A hybrid learning environment (i.e. a combination of online and face to face activities) provides individual and collaborative opportunities for experiencing and analysing the interplay between people and technology. To encourage creative, lateral thinking in student work and to address contemporary issues on the topics taking place during the semester, the curriculum is routinely adapted to respond to the ideas emerging from classroom activities as they unfold. The next section of this chapter describes the philosophy underpinning the unit's curriculum design, two particular pieces of assessment and some online learning activities that have proven effective in meeting these goals. Evaluating the outcomes of this approach in the case study unit suggests there are benefits for STS curriculum development more generally.

SAMPLE CURRICULUM AND ASSESSMENT

Aims and Objectives

The case study unit critically examines the interplay between society and technologies to help students develop an advanced understanding of the key social issues associated with the design, uses and consequences of ICTs. It aims to make visible the social and technical choices involved in their design and use both today and in the future. In broad terms, there are three core themes in the unit: i) technologies, knowledge and social change; ii) complex knowledge systems and digital "libraries"; and iii) collaboration. The unit's objectives are to enable students to:

- Critically examine the interplay between people and technologies;
- Develop advanced understanding of issues affecting the transfer and use of information and knowledge in a variety of social & institutional contexts;
- Demonstrate proficiency in analysing social aspects of ICTs, including benefits and drawbacks of technological implementation; and
- Demonstrate awareness of unanticipated impacts of implementing ICTs on workflows and communities of practice.

Consistent with SI principles, the content takes into account human interaction with technology in a range of institutional and cultural contexts of development and deployment. The interplay of the social and technical elements is thoroughly embedded in the SI approach to ICT study, making it a useful contributor to STS education more broadly.

Teaching and learning strategies focus on interactive, constructive learning. They also support student development of the critical analysis skills and imaginative capacities required to understand and work with the dynamic nature of relationships affecting the transfer and use of knowledge and information in emerging socio-technical contexts. Tutorials are designed to promote informed discussion of key social issues associated with the design, uses and consequences of ICTs. Each session integrates formal input, personal and professional experiences, discussion, reflection and action. Collaborative activities figure prominently to enable students to develop and reflect on the work practices that they are likely to need once they enter the workforce.

Thematic Content of a Social Informatics Course

Thematically, the content can be broken into the following seven components:

- concepts and issues of social informatics (e.g. Kling, 1999; Kling et al, 2005; Lamb & Sawyer, 2006);
- exploration of the 'isms' of socio-technical systems (determinism, luddism, utopianism/ dystopianism, globalism, etc.);
- ICTs and social change;
- the interactions between people and ICTs within institutional and cultural contexts;
- social issues in decision-making for implementing ICTs (including design and usability);
- ramifications of new technologies for work practices (e.g. workflows, invisible work, collaboratories, digital libraries); and
- the power, privilege and interpretation of knowledge vis à vis emerging technologies.

These SI themes foreground modes of knowledge production and the role of information in society, rather than the building of particular tools. In this way students are invited to develop new lenses for examining human-machine relations and the bidirectional influences constantly taking place.

Students examine ways that social choices and practices influence the shaping of technology and the ways the design of a particular technology can shape the choices made by people, individually as well as collectively. The theme of emerging technologies forms a "red thread" through the curriculum and the assessments prepared by the students. This decision poses a challenge to the instructor because the content of weekly lectures needs to take on issues arising at that time. It also presents challenges to the students because they are compelled to move beyond assumptions about socio-technical systems that are based on established practices and products. In doing so, they learn very quickly how to move beyond present practices to critically speculate about implications of design in future scenarios. Working with emergent and future scenarios encourages innovative thinking about STS issues.

Core Principles for Assessment and Tutorial Activity

The contemporary context of working with and on sociotechnical systems outlined in the first section of this chapter calls for both imagination and analytical ability. Thus, preparing students to work with and in these digital landscapes involves teaching and learning strategies that enable them to develop a diverse suite of skills: critical thinking, research, creativity, imagination, curiosity, ethical practice, good communication skills and good networking skills (tools & people). Fostering these skills in the classroom will help students develop the innovation and imagination needed in the workplace. While this case study curriculum was designed to complement a suite of technical and theoretical subjects, the SI principles and learning strategies underpinning the design of the learning activities in this unit could be adapted to other STS courses and classroom activities.

The principles of SI described above not only inform the content of the unit, but the delivery of it as well. SI, it can be argued, is a social movement. By foregrounding issues of intention and agency in relation to socio-technical systems, more deliberate attention is given to the ethics of socio-technical design. In this way students are made mindful of the consequences of design and invited to reflect critically on alternatives. Furthermore, as the development of this case study unit also demonstrated, collaboration can be a site of study as well as a way of learning.

There were some other notable influences for this approach that warrant particular mention as contributors to the creative learning environment that is conducive to innovative thinking:

- The principle of "serious play" (e.g.: Schrage, 2000; Rieber, 2001; Wasserman, 1992);
- Noel Gough (2004) and his use of speculative fictions and fabulations;

- Erica McWilliam and her approach to the teaching of creativity (2007) and "unlearning" pedagogy (2005).

Below each will be explained in a little more detail.

Serious play is a technique often used in the schoolroom and in the workplace. Michael Schrage's (2000) book focuses on the way that experimentation with prototypes in companies like Boeing, for instance, becomes a critical condition for innovation. His book makes a strong case for introducing more serious play opportunities into work and learning settings. As Selma Wassermann (1992, pp 133) writes:

I believe that with play, we teachers can have it all: the development of knowledge, of a spirit of inquiry, of creativity, of conceptual understanding—all contributing to the true empowerment of children. Is it possible that serious play is, in fact, the primary vehicle through which serious learning occurs? If that is the case, might we consider introducing serious play at all stages of a student's learning, from kindergarten through graduate school?

Lloyd Rieber (2001) stresses a similar point when describing his efforts to draw on his experiences as an elementary school teacher once he had made the move to teaching at graduate school level. Applying serious play as a teaching technique in an STS classroom, therefore, can not only contribute to serious learning, but familiarise students with techniques that might kick-start innovative thinking in the workplace.

Similarly, imaginative fiction writing has been found to nurture critical thinking about the complexities surrounding a range of science, technology, social and political issues. Neil Gough (2004) writes about the pedagogic value of such fabulations and speculative fictions. *Fabulations* bring the unthinkable into representation, using fiction to offer a world clearly and radically discontinuous from the one we know. The invitation to speculate without constraint can unleash imaginative responses to any number of issues. In the classroom, such imaginative work is very helpful for stimulating discussion about issues in contemporary digital environments and critically examining potential consequences of implementation. Gough cites Scholes (1976) who adds that:

in works of structural fabulation the tradition of speculative fiction is modified by an awareness of the nature of the universe as a system of systems, a structure of structures, and the insights of the past century of science are accepted as fictional points of departure ... It is a fictional exploration of human situations made perceptible by the implications of recent science. (Scholes, 1976, pp 54-55 as cited by Gough, 2004, pp256)

Gough provides some examples of his own application of *fabulations* and *speculative fiction* in the classroom which worked well as classroom discussion starters in this case study curriculum.

As mentioned earlier, a sense of wonderment became part of the philosophical scaffolding for the unit because it is considered an essential ingredient for success in the area of socio-technical design. Experimenting with this approach in the classroom over the years has shown that encouraging students to ponder about the way things work helped them to better understand how the unintended or unexpected consequences of designing and developing ICTs come about in the technologies under study. Such understanding is an important component of SI curriculum so it was important to find ways to support it in this case study classroom. In a sense, such ponderings are an extension of the fascination that is characteristic of the experimentation and adventure associated with child's play. This sense of wonder connects to speculative fiction and fabulations which invite pondering about various future possibilities. Thus, students were encouraged to collect and craft such writing at various points in the unit. This approach to teaching, however, is valuable for any STS program. Devising alternative outcomes for the implementation of a prospective

technology as a speculative fiction, for instance, invites students to freely examine social as well as technical consequences from a range of perspectives.

One final influence worthy of specific mention focuses more on the teacher's approach to learning—or more precisely about "unlearning" some conventional classroom teaching that Erica McWilliam (2005) suggests can hold students back from developing the creativity and imagination called for in so many work and life roles. McWilliam makes the case for unlearning in order to inform learning. It is the teacher and not the student she suggests needs to do so. Her educational research sheds light on ways that traditional assumptions about the classroom learning environment can be transformed. Her approach to teaching creativity (for example, 2007) shows how her approach to teaching and learning can support the type of learning environment this chapter suggests can enhance learning in the STS classroom. Her advice is a helpful complement to activities informed by serious play and speculative fiction.

Drawing on these influences helped craft a curriculum intended to foster critical thinking skills in the students and make them more aware of the sociotechnical complexities of ICT design and use. It led to the development of core principles for developing the case study curriculum:

- **Seeing the World Through Different Lenses:** activities in class and in assessment built on the trans-disciplinary and multiple perspectives called for in SI (see for example Lamb & Sawyer, 2005);
- **Serious Play**: critical reflection and creativity encouraged through assessment tasks;
- **Fostering Creativity and Imaginative Thinking**: students are encouraged to read and write speculative fictions and fabulations. Through the works of fantasists and fabulations, they critically examine past, present and future socio-technical possibilities;
- **Wonderment**: encouraged to foster the imaginative thinking and problem-solving required to successfully navigate the change characteristic of socio-technical environments.
- **Collaboration**: built into the serious play activities in the class room as well as the ongoing online *collaboratories* used by teams to build wikis about the emerging technologies discussed in class and then examined more critically in the final assignment.

Tutorial and Assessment Examples

These principles are put into practice each week in class and in each assessment item. The overall intention is to encourage critical analysis and reflection alongside creativity through activities, discussions and assessment tasks. The three examples provided in this section illustrate how the approach can benefit student learning about the bidirectional relationship between social and the technical concerns associated with ICT design and use as well as help them develop the essential work skills discussed earlier in this chapter.

Imagineering and Serious Play

Early in the unit, students are introduced to a set of serious play challenges. In his discussion about serious play, Schrage (2000) uses the term *imagineering*, a term very fitting for an STS classroom that seeks to combine the analytical skill of engineering, for instance, with imagination or speculative thinking. As the case study student cohort included engineers, computer science as well as humanities and social science students, this hybrid term of two complementary skill sets was a particularly attractive way of getting students to think of ways they could harness the benefits of both. For example, after a lecture introducing students to themes of technologies, knowledge and social change, they undertake a series of serious play challenges. Through brainstorming, association games and role play they are asked to imagine the past as present, the present as future and the future as the present.

A class-wide discussion opens this particular activity with speculation about the past as the pres-

ent. Students are asked to describe life in a world where a technology now considered old or obsolete was just about to be introduced to everyday life (examples used in this case study unit have included the printing press, paper, clock, wheel, car). Individually students take a few minutes to write down a couple of sentences of what impact the particular technology selected has on the way "things are done today", "today" being the period when the selected technology was invented. After they have reflected on everyday life in this imagined world, they are asked to delete these impacts from their memory (this is in itself an interesting problem dealing with the concept of knowledge) and individually describe the *world view* **before** the introduction of this technology. Class discussion then begins with imagining being alive at the time when the selected technology was just invented. Students brainstorm about life in their new present world and discuss how the introduction of the "new" technology would have shifted their world view. There is also opportunity to reflect on ways that geography and social status might influence their relation to this new technology. The class agrees on at least three key points about the impact for posting in the class blog. The class discussion often becomes a free flowing, student-generated discussion combining what students know historically about the periods in question with ways they imagine everyday life would change when a technology that we now associate with dramatic social and technical change in its time was initially introduced.

The second imagineering challenge in this particular week's tutorial gets students to imagine the present as future: they have to imagine being alive before the invention of the mobile phone and write down a couple of sentences describing what the world was like before the introduction of this technology. They describe a typical day as a student at university before mobile phones were invented. They describe their social lives during the week, weekend, day and evening. They discuss the way they communicate with friends, family, work and class colleagues. The students use this reflection to create one sentence about how the invention of the mobile telephone has shifted their world view—how the world differs for them as a result of the mobile phone. In small groups (the collaboratory teams discussed in the third example of this section), they share what they have written as a point of departure for a discussion of the themes introduced in that week's lecture. This serious play activity is very challenging for young undergraduate students, who are very active mobile phone users and cannot imagine living without their phone. It is a very effective challenge when paired with the first (past as present) task.

After these different twists on time, they are then asked to work in their collaboratory team to create a collage blending a range of artefacts and labels they have collected during the week to tell a story responding to that week's themes. In the following week, the collages are used as starting points for the construction of a fabulation each team crafts to tell a story about how they imagine their world will look 100 years into the future. The performances of each team are then used as a starting point for discussion about mobility, networking and the role that ICTs might play in supporting or confounding human communication. This manner of speculation and imaginative thinking helps students reflect on the many possible outcomes that can result when a technology is introduced in a society and the complex interplay between social and technical developments.

Reshaping Assessment

Originally, the first assessment in this unit was a literature review assignment used to introduce students in the unit to historical and contemporary debates in the field of SI and get them to read widely in the area. Exposure to the literature and key themes of the unit has always been an essential starting point for learning. Much of this material helps students complete the other two assignments, including the collaborative assessment described in the third example of this section. Earlier versions of the unit that included the traditional literature review task demonstrated students were not stray-

ing very far from the set readings. Furthermore, while they were encouraged to read widely from non-academic works (like science fiction and music lyrics) to look for evidence in their daily practices of themes covered in the unit, they appeared unable to make the creative leaps that would allow them to connect the non-academic world they experienced in between classes to the world they were reading about as they prepared the assignment. As this assignment is a keystone for the unit, it needed revising to better foster the diverse suite of skills described earlier in this chapter.

Transforming the literature review into a digital scrapbook assignment proved successful for encouraging the students to read widely, reflect critically and think creatively about the complexities of the social shaping of information and the theoretical underpinnings of the interplay between people and technology. The process of making the scrapbook allowed the class to discuss the structuring and presentation of knowledge artefacts, the impact of various technologies on the communication of ideas and to invite the students to refine and direct their already existing technical skills in ways that were personally meaningful for them. The scrapbook metaphor worked well to get students into the habit of collecting what they were encountering in early weeks of the semester. It encouraged both students and teacher to bring in samples to share and discuss on a weekly basis. In this way, the previous perception of the assignment as an onerous one involving heavy library research was removed. Students could use the content of the weekly lectures and classroom activities more effectively to incorporate scrapbook elements into the assessment. In this way the intended outcomes of the original literature review were greatly enhanced.

Converting the assessment to a digital scrapbook did not remove the need for analysis. It merely reoriented it in a manner more fitting for an STS classroom where students had technical skills that they were eager to harness for such work. Students still had to select, categorise and synthesise the significance of their growing collection in relation to themes, theories and readings introduced in class. The digital format encouraged them to be more inventive with their presentation and to collect a more diverse assortment of material from their daily encounters with the SI themes. The appeal for students in the case study unit can be attributed to the fact that these students already operated in a highly digitised and mediated environment. By connecting the medium of the assignment more to their daily practice and preference, these students became more readily engaged with socio-technical complexities they themselves encountered. The connection to first-hand experience helped them to better appreciate the concerns introduced through the SI readings introduced in class.

The revision proved a step in the right direction in terms of the core principles described earlier in this chapter. Not only were the assignments they submitted more diverse than in the former literature review task, but the students also found it a more satisfying learning experience—to the point where some students carried on building their scrapbook in the semesters after completing the unit. The results of this change suggest the task was successful in encouraging students to look at their surroundings with "new lenses." Developing such perspective is an important learning device for innovative thinking. Unlike the earlier literature review assessment (where students were not reading beyond the texts introduced in class), in most cases, students completing this new assessment created collections uniquely their own. They presented song lyrics, movies, advertisements, cartoons, conversations and even recollections of events they recognised as being connected to themes discussed in class. Through the construction of their scrapbook and analysis of its contents, students became more engaged with the complexity of ICTs in society. They grappled with the socio-technical interplay in ways that were directly linked to their existing skills and experience. In this way, the assignment succeeded in getting them to read widely and creatively construct a knowledge artefact on the themes of social informatics. Students' ability to combine traditionally separate skill sets is evidenced by their creative and academic knowledge artefacts. They were able to

demonstrate creativity as well as critical reflection in relation to their examination of the complexities of the social shaping of information and ICTs. What was less than ideal, however, was the thoroughness of students' use of the academic literature on these topics—something that is discussed further in the last section of the paper.

Collaboration and the Collaboratory

The remaining two assessment items were interlinked, as both involved critical examination of the socio-technical challenges associated with six different emerging technologies. One was group based, the other an individual essay. The technologies discussed are selected at the start of the unit to include hardware and applications as appropriate. Examples from past semesters include humanoid robots, intelligent agents, immersive environments, wearable computing, mobisodes, and mashups. Both assignments examine the evolution of these technologies, the complexities associated with their adoption by various sectors of society and the interplay between people and a technology within various social contexts. Through completing these tasks students demonstrate their understanding of theories underpinning the acceptance or non-acceptance of ICTs and their evolution, the bidirectional influences of society and ICTs, and the implications for future uses of these technologies within particular contexts of use.

The group assignment ran for 10 weeks of the 14-week program and involved working as part of a *collaboratory* along the lines described by Atkins (1996) and Schleyer (2001) to construct a wiki about one of the six emerging technologies addressed by the class that semester. Each team was also responsible for leading a two-week class-wide discussion in an online forum dedicated to their particular technology. The content of each wiki and discussion forum became the starting point for the final individual assignment: a critical evaluation of one of the six emerging technologies (students had to select one other than that which was the subject of their own collaboratory's wiki).

Working with emerging technologies on these assignments gives the class a chance to speculate about a number of potential implications for future uses. Students have to find appropriate background on these recent phenomena, which is conducive to working in a team and sharing responsibilities. Because they are recent developments, they are compelled to think laterally about connections and distinctions across various technologies and contexts of use.

Developing team work and communication skills are important skills for students that have long been recognised as essential features in many classrooms. The collaboratory assignment involved both face-to-face and online collaboration, so students had to develop skills suited to both environments. Each team had a personal work zone within the unit's online learning site (e.g.: private discussion space, file exchange, wiki page) to use for group-only communication and behind-the-scenes work. Teams were also encouraged to meet in person as required. Each team was given flexibility to craft their wiki according to their collective talents, though there were some basic guidelines and scaffolding provided as a starting point. Successful wiki development called for skill sharing and utilisation of the special talents (both technical and inter-personal) of individual members of each collaboratory: some students were more comfortable and capable with back-end development of audio and visual elements, others were more effective at undertaking research for content, while others were better at project management. Students in each team were also expected to distribute the tasks associated with the two-week forum they moderated on their assigned technology. Accompanying their wiki, each student submitted a reflective report about their individual experience with collaboration and lessons learned about the conditions for effective collaboration and communication in both environments.

The wiki task was an ideal vehicle for teaching students about collaboration, group management and communication. Students in each collaboratory had to appoint moderators, weavers and coordinators for the class discussions they directed. In some groups

these roles overlapped. Moderating and weaving duties were critical for encouraging wide participation, for identifying points that are valuable for discussion and encouraging a variety of responses to the points that are raised. The online moderator presides over the discussions, initiating discussion, keeping it on track, and inviting contributions from participants. Weaving describes the flow of discussion and how it can be pulled together. In reality, this is the synthesising of information. Although weaving could be done in face-to-face groups, the trace of messages in an online forum makes it far easier to draw together the various threads of a discussion. Leader, moderator and weaver styles vary from the very active to the more reflective and patient. The effort required to do the job well will vary a lot. Minimum requirements were established for the online forums associated with this assignment, but the students were given flexibility in terms of ways they guided class discussion about their assigned emerging technology.

Giving students the responsibility for managing their work in this way increases the opportunities for student-led learning that McWilliam (2005) encourages. In an STS classroom, it is particularly useful for helping students develop critical understanding about collaborative communication tools. In the case study classroom, this approach led to some very inventive and engaging wikis on these topics. The interplay between wiki construction and online discussion both within each team and across them during the semester also suggested students were learning from one another not only about the emerging technologies under discussion, but also about techniques for wiki construction, engaging presentation and the processes of collaboration and online communication. This student-generated learning is very beneficial for meeting some of McWilliam's "unlearning" suggestions. Furthermore, the agility called for in this collaboratory work, both in terms of collaboration and content development, prepares students for the dynamics of work environments that are increasingly team-based and virtual. During the semester, students find this collaboration the most challenging task but also remark that they find it one of the most rewarding. Former students now in the workforce have also reported that the task was one of the best preparations for their jobs.

LESSONS LEARNED: CHALLENGES REVEALED IN ONE CASE STUDY AND FUTURE PROSPECTS

Overall, the approach to teaching and learning described in this chapter resolved many of the challenges that prompted the changes in the first place: the need for critical engagement with SI principles; enhancing opportunities for collaborative work in dynamic online environments; supporting the development of imaginative approaches to STS issues. The unit has been able to foster imaginative approaches to STS issues by creating an atmosphere of openness to discussion and playfulness inviting different approaches to issues and tasks. Designing tutorial tasks to tap into creativity and open up different perspectives (e.g. the use of collage, fabulations, Gestalt 'games', cartoons) was also effective in this regard.

Refinements and revisions of the unit content over the past few years have transformed the unit from a traditional mode of delivery into a far less structured unit more responsive to issues arising as the semester unfolds. Given the dynamics of STS issues, this flexibility is very beneficial for teacher and student alike. While there remain challenges in terms of getting the analytical/imaginative balance right, student performance has shown the learning experience is far more effective at promoting a potentially life long process of

- combining analytical with imaginative and lateral thinking; and
- learning techniques to promote innovative approaches in individual and team work.

It has been exciting to witness the transformation of student engagement with the themes covered in the unit and the techniques used to deliver the content. The approach to teaching and learning outlined in

this chapter, however, has particular merit for socio-technical design primarily because the intellectual agility called for using such pedagogy offers ideal conditions for fostering the creativity and innovative thinking we want for our students. Getting students to collaborate on building student-generated content on socio-technical issues and to think about the conditions conducive to collaboration is another effective skill well served using techniques like those illustrated in this case study.

Challenges in the curriculum design remain, particularly in relation to the digital scrapbook assignment. Despite the demonstrated value in allowing students to make the knowledge artefact they are devising personally meaningful, it is still sometimes difficult for them to appropriately organise and structure the creative elements of their scrapbook and link the imaginative "texts" they have collected to SI themes with critical analysis of the theories under study. So, while the digital scrapbook was a successful innovation in terms of encouraging students to read widely and develop imaginative collections and explore alternative perspectives, many of the assignments submitted were missing explicit links between their personal exploration and the theories introduced in class. It was as if some of these students saw the encouragement to be creative and examine non-academic texts as an indication that they should not use the readings discussed in class. These challenges will be addressed in future iterations of the unit by providing students with some assignment samples from earlier classes.

There are no recipes that STS teachers can present to students to prepare them for the dynamic work environments they will enter. The lessons learned in this one particular case study, however, suggest that the class activities and assessments discussed here could inform the development of one unit or a suite of units in any program that seeks to prepare students to work with and in complex socio-technical contexts. Regardless of how, the underlying philosophy outlined in this chapter can be flexibly applied to any STS program in order to help students prepare for tomorrow in the classrooms they sit in today.

REFERENCES

Atkins, D. (1996). Electronic Collaboratories and Digital Libraries. *Neuroimage*, *4*(3), S55-S58.

Bawden, D. et al. (2007). Towards curriculum 2.0: Library/information education for a Web 2.0 world. *Library and Information Research, 31*(99), 14-25.

Clandinin, D. J., & Connelly, F. M. (2000). *Narrative Inquiry: Experience and Story in Qualitative Research*. San Francisco, CA: Jossey-Bass.

Clayton-Pedersen, A., & O'Neill, N. (2005). Curricula Designed to Meet 21st-Century Expectations. In D.G. Oblinger & J. L. Oblinger (Eds.), *Educating the Net Generation*, An Educause eBook, available at http://www.educause.edu/ir/library/pdf/pub7101.pdf.

Gough, N. (2004). Rhizomantically Becoming-Cyborg: Performing Posthuman Pedagogies. *Educational Philosophy and Theory*, *36*(3), 253-64.

Grant, L. (2007). *Learning to be part of the knowledge economy: digital divides and media literacy*, FutureLab Discussion paper, September 2007, available at: http://www.futurelab.org.uk/resources/publications_reports_articles/discussion_papers/Discussion_Paper816.

Hartman, J. et al. (2005). Preparing the Academy Today for the Learner of Tomorrow. In D.G. Oblinger and J. L. Oblinger (Eds.), *Educating the Net Generation*, An Educause eBook, available at http://www.educause.edu/ir/library/pdf/pub7101.pdf.

Kaluzniacky, E. (2004). *Managing psychological factors in information systems work: An orientation to emotional intelligence*. Hershey, PA: Information Science Publishing.

Katz, R. (Ed.) (2004). *The human side of managing technological innovation,* 2nd ed. New York: Oxford University Press.

Kling, R. (1999). What is Social Informatics and Why Does it Matter? *D-Lib Magazine*, January 1999, *5*(1). Available at http://www.dlib.org/dlib/january99/kling/01kling.html.

Kling, R., Rosenbaum, H., & Sawyer, S. (2005). *Understanding and communicating social informatics: A framework for studying and teaching the human contexts of information and communication technologies*. Medford, NJ: Information Today, Inc.

Lamb, R., & Sawyer, S. (2005). On Extending Social Informatics from a Rich Legacy of Networks and Conceptual Resources. *Information technology and people, 18*(1), 9-20.

Learning Futures. (2007). Symposium Website, event held at The Australian National University, Canberra, September 10 and 11 2007, Available at http://learningfutures.anu.edu.au/.

McWilliam, E. (2007). Is Creativity Teachable? Conceptualising the creativity/pedagogy relationship in higher education, *HERDSA Annual Conference*, Adelaide, July 9-11. (for publication in HERD).

McWilliam, E. (2005). Unlearning Pedagogy, *Journal of Learning Design*, *1*(1), 1-11.

MyCyberTwin. (2007). Company Website, Available at http://mycybertwin.com/company/.

O'Sullivan, E., Morrell, A., & O'Connor, M. A. (Eds.) (2002). *Expanding the boundaries of transformative learning: essays on theory and praxis*. New York: Palgrave.

Richardson, L. (2000). Writing: A Method of Inquiry. In N. K. Denzin and Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 923-48). Thousand Oaks, CA: Sage.

Rieber, L. P., Smith, L., & Noah, D. (1998). The value of serious play. *Educational Technology*, *38*(6), 29-37.

Rieber, L. P. (2001). *Designing learning environments that excite serious play.* Paper presented at the Annual Meeting of the Australasian Society for Computers in Learning in Tertiary Education, Melbourne.

Schleyer, T. K. L. (2001). Collaboratories: Leveraging information technology for cooperative research. *Journal of Dental Research, 80*(6), 1508-1512.

Schrage, M. **(**2000). *Serious play: How the world's best companies simulate to innovate***.** Boston, MA: Harvard Business School Press.

Wassermann, S. (1992). Serious Play in the Classroom: How Messing around Can Win You the Nobel Prize. *Childhood Education*, *68*(3), 133-39.

Weight, J. (2006). I, apparatus, you: A technosocial introduction to creative practice. *Convergence: The International Journal of Research into New Media Technologie*s, *12*(4), 413-446.

KEY TERMS

Collaboratory: a form of online collaboration; sometimes referred to as a "centre without walls" a collaboratory is an environment to support teams in communication and collaboration, using digital collections for access and dissemination of information and knowledge. Schleyer (2001, pp 1508) describes it as: "An information technology infrastructure that supports cooperation among individuals, groups or organizations in pursuit of a shared goal by facilitating interaction, communication, and knowledge-sharing."

Fabulation: Gough (2004) describes fabulations as bringing the unthinkable into representation; they are fictions that offer a world clearly and radically discontinuous from the one we know. He cites Scholes (1976) who adds that: "in works of structural fabulation the tradition of speculative fiction is modified by an awareness of the nature of the universe as a system of systems, a structure of structures, and the insights of the past century of science are accepted as fictional points of departure … It is a fictional exploration of human situations made perceptible by the implications of recent science." (Scholes, 1976, pp 54-55 as cited by Gough, 2004, pp256).

Serious Play: "…that special kind of intense learning experience in which both adults and children voluntarily devote enormous amounts of time, energy and commitment and at the same time derive great enjoyment from experience." (Rieber et al, 1998, pp29).

Social Informatics (SI): "the interdisciplinary study of the design, uses and consequences of information technologies that takes into account their interaction with institutional and cultural contexts."(Kling, 1999)

Speculative Fiction: can be related to a range of narrative forms that invite speculation about future possibilities and prospective responses to current situations. Writers and theorists like Donna Haraway, Ursula Le Guin and Noel Gough, for example, draw connections between a number of SF phrases: *speculative fiction, science fiction, science fantasy, speculative futures, speculative fabulation.* Gough uses the term in association with the notion of the *fabulation*.