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A Micro-labs Design: Informal Learning in a Social Networked Setting

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Abstract:

The Internet is fundamentally changing the way learning occurs. In the last 10 years, universities have adopted technology in a way that reinforces a dominant teaching paradigm. As online culture and technology change, new paradigms of learning and teaching become more tenable. As universities adjust their collective teaching styles to incorporate these changes they can continue to prepare students become engaged contributors in a community. We explicate the design of a university course architecture which supports and incorporates "web 2.0" informal learning principles, enabling students to entirely create their own curriculum with the goal of contributing all objects created by learning back to a learning community of practice, and an Internet audience. This type of course design builds upon a micro-labs design (Pendleton-Jullian 2009), and seeks to harness both the student's intrinsic desire to learn and the ease of access to knowledge created by advances in communication technologies.

Keywords: Informal learning, Intrinsic Learning, Web 2.0, Learning 2.0, Open Educational Resources, Student-directed learning

I. INTRODUCTION

Preparing a labor force for the constantly changing industries of the knowledge economy is an on-going challenge. As universities are largely unable to meet demand for classes in rapidly growing niche areas, students are less prepared for the job market. To meet this challenge, some professors are moving towards approaches that parallel how students are expected to learn "on the job." We take a radical position and ask how a completely student-driven IS course would function in the university environment.

Our research question asks: What is the design of an information systems course that is based completely on student-driven informal learning?

After examining relevant literature, we outline our design science research method combined with a pragmatist case study. We propose a course design that facilitates informal learning in student social networks and seeks to harness the student's intrinsic desire to learn. Next we explicate the design of an micro-lab, illustrating it with quotes from students. We find that students with a strong foundation in the core IS courses thrive in the micro-labs environment, and are very effective at employing technology and social networks to find their own educational resources.

II. LITERATURE REVIEW

Learning is inherently linked to social networks. A long research tradition concludes that learning is a function of social discourse and individual experience (Brown et al. 1989). Indeed a study of Harvard students presents evidence that those “who study outside of class in small groups of four to six students, even just once a week, benefit enormously. Group meetings are organized around discussions of the homework, and as a result of their study group discussion, students are far more engaged and better prepared for class, learning significantly more” (Light 2001). Social networking tools enable this conversation to take place in a community regardless of where the members are located. The community draws people into debates, relationships, and discussions which add context and meaning to the content shared.

The need of better education solutions to solve complex social issues has been discussed at length in the literature. Many have referenced Internet technologies as an enabler to fill unmet demand for University education in the world (Brown 2006). Likewise, the significance of the rapidly changing cultural dynamics and their effect on learning has been addressed in the scholarly and popular presses (Atwood 2008). Recently work applies these concepts to the University classroom. Albrecht and Mathews (Albrecht and Matthews 2009) relate their experience using a community based learning environment, and how it meets the qualifications of an authentic learning environment, despite its online nature.

Micro-labs are a simple and efficient mechanism for providing students informal learning opportunities in niches of their choices (Hagel and Brown 2006). It is valuable to contrast a normal lab, which is found at most universities, with micro-labs. Labs are large expensive operations that might take years to set-up and are expected to run for many years. Micro-labs, by contrast, are quick to set-up and cheap to run with as few as 2-3 students and a faculty advisor who meet in the Library. Many small, tightly networked micro-labs would collectively create an impact far beyond a few larger labs.

"[these micro-labs are] easier and quicker than large centers to plan, build and reconfigure as projects shift and move in other directions, they facilitate grassroots creative research. These highly networked micro labs, focused on topics of deep inquiry, need not have dozens of participants sitting in the same room. A team of participants with the necessary skills might be distributed among several institutions, several countries, networked digitally and through ongoing academic relationships...Because they are networked, a single micro-lab's reach extends beyond the team itself or the duration of a specific project. When the opportunity arises, these micro-labs can coalesce into one larger lab with tremendous diversity and richness of talent. Breaking apart again, they may redistribute talent and resources. Analogous to the way 'process networks' mobilize highly specialized small companies across an extended integrated design and manufacturing process, a network of micro-labs creates a horizontal rhizomic structure in which the whole is much greater than the sum of the parts. The networked micro-lab can adapt to new questions and opportunities from outside as well as inside the network." (Pendleton-Jullian 2009)

III. RESEARCH METHODOLOGY

Artifact Development

To develop the design of a university course that develops students into contributing members of a learning community, this research uses design science methodology. This general design of the method was created by Takeda et al. (Takeda et al. 1990), and has been extended into information systems research by Vaishnavi and Kuechler (Vaishnavi and Kuechler 2004). In this general design cycle, the research must begin with *Awareness of a Problem*. One a problem is identified, the researcher generates *Suggestions* to solve it using existing theory bases, or by an appropriate research methodology. The design is then implemented during the *Development* phase and *Evaluated* based on its usefulness in solving the original problem. This evaluation yields further Suggestion and Development.

The *problem* identified in this research is the need to increase university education methods to incorporate new technology cultures and better prepare students for a dynamic work environment. Recent shifts in the way students learn (Brown and Adler 2008) has prompted changes pedagogical methods. However, many teachers are unfamiliar with "learning new tricks" of teaching. While the literature offers support for the need of such changes, the unique aspects of how such a course can be structured has yet to be explicated.

A further literature review will be helpful in identifying recommendations and *suggestions* made by academics and educators in creating designing such a course. However, a literature review along may not best determine all the necessary structure. To better determine the structure of the course, the websites of similar courses which have been undertaken ("Unclass | island.byu.edu" 2008.) in recent months will be examined, and viewed as the course develops.

With the knowledge generated in the *suggestion* phase from the literature review, the third phase of *development* is undertaken. To achieve generalizability to university courses in different disciplines, principles will be taken from specific approaches and abstracted to a higher level, however specificity will be retained to provide value to educators implementing these course-structuring techniques.

After a core set of guiding principles have been developed, it is necessary to evaluate the logical artifact in terms of its functionality and performance in the *evaluation* phase. At this stage, qualitative methods will be used "to determine how well an artifact works" (Hevner et al. 2004). Qualitative interviews with students who choose to participate in the course will be undertaken to evaluate their utility.

Artifact Evaluation

Because the design of such a course university course has been unexplored, we decided to employ a qualitative field study of a undergraduate information systems course in the business school of a large university in the western United States. This method affords us the opportunity to capture student reactions to the course design, and measure what resources they opt to use in their studies.

We employed principles of pragmatist qualitative research in our study (Goldkuhl 2004; Rescher 2000). Our research questions were investigated by a longitudinal case study that comprised the duration of the course. This methodology is appropriate when "how" and "why" questions are investigated regarding complex issues (Yin, 2003). A case study allows for the understanding of the context and the process of the phenomenon in a real-world setting, or the "field", which is not possible in a laboratory.

In addition to following student activity on the course website/blog, the 14 students in the class were given an open-ended questionnaire (see Appendix A). No incentive was given for response; and six students responded to this questionnaire. As the questions were to be used for qualitative purposes, a low response rate does not endanger statistical validity, however may be representative of a non-response bias.

IV. THE DESIGN OF A MICRO-LAB COURSE

In this section, we will discuss the course architecture we employed which incorporated the concept of micro-labs. Each student did four projects during the semester either individually or as a group. The class did not meet together as a whole for most of the semester. The students and professors met at the beginning of the semester so the teacher could orient the other students, set class norms, and to suggest project topics that individuals or groups might want to do together. The class met together after each of the four learning periods to share their learning and plan for the next project.

In a micro-lab, student teams outline a plan of study and learning deliverables with the help of an instructor. Each learning contract is fulfilled over the period of 2-6 weeks. Coached by an instructor, students utilize any content they wish, including Open Educational Resources, to learn material in an authentic learning environment (Herrington and Oliver 2000). The learning outcomes consist of deliverables which are typically given to the community, including blog posts, tutorials, software tools, and conference presentations.

There were four steps to each project in the mini-labs course. First students 1) create and post on the class website a learning contract specifying what they wish to learn, their process for learning, and planned deliverables. This contract is 2) revised with feedback from the instructor and fellow students. The student 3) completes the proposed learning contract and 4) shares the completed deliverables by posting them to the class website and delivering a presentation in the form of an ignite-style presentation to the class. These steps are outlined in Figure 1 below.

1. Formation of Learning Contract

The project proposals are written by a student or a group of students, and define what learning will occur during a 3-4 week period. Proposals can be a "learning project" where students research a topic, and write up a report or a "building project where the student defines what they will create. Examples of learning projects include a report on Java Enterprise Edition 5, or wiki pages describing Amazon web services. Building projects include making an iPhone or Android application, a lyrics visualization plug-in for iTunes, or an SMS gateway. During the last week of each project, students start to prepare learning contracts for the next iteration.

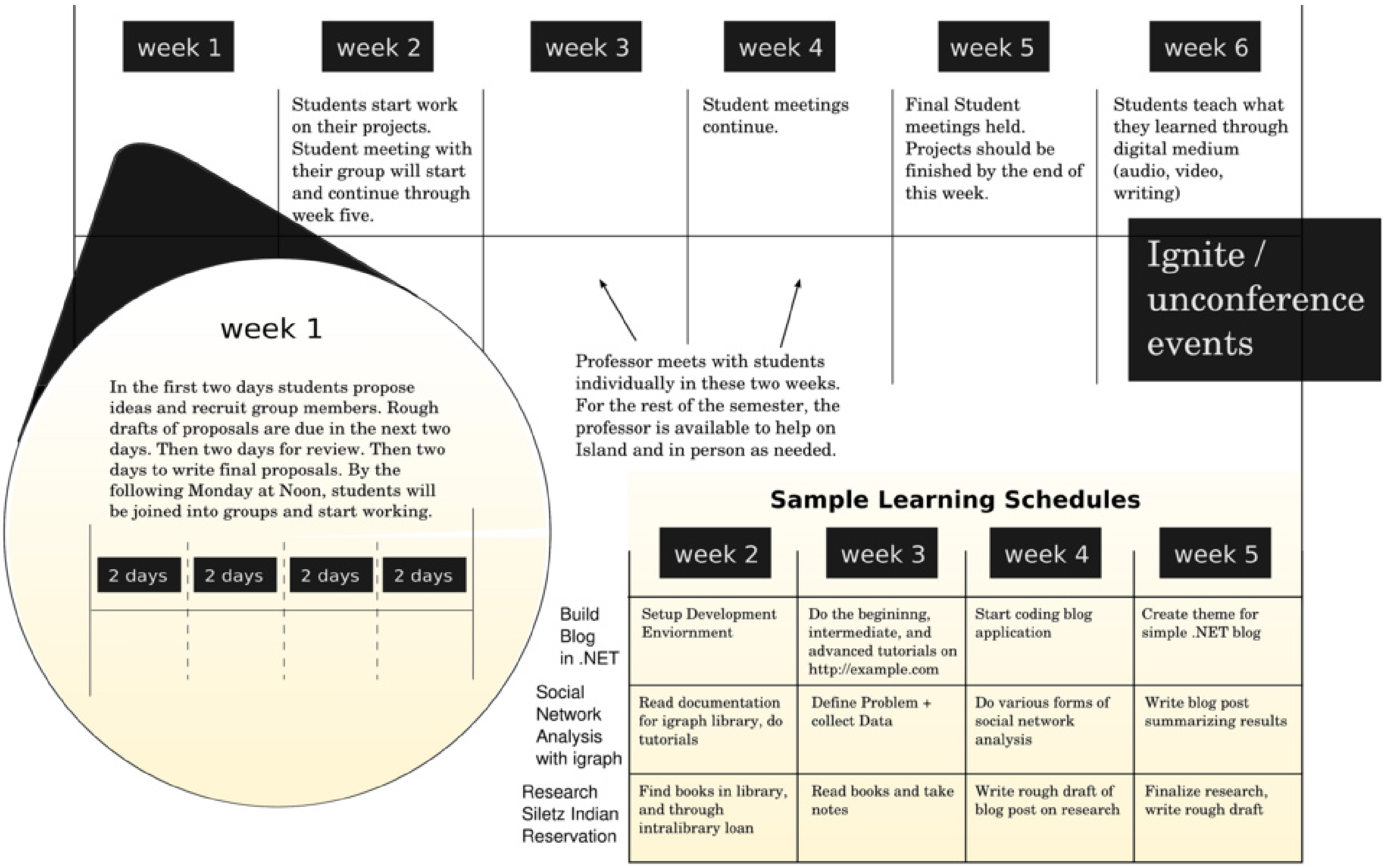

Figure 1. Example outline for a six-week student directed learning session.

An obvious feature of the learning contract is that it is written entirely by the student. This allows for intrinsic motivation, as is illustrated in this student quote: *"I was able to learn a lot about and use a bunch of technologies that I never would have been able to otherwise. I feel like I learned more than in a normal class, and because I got to choose what I wanted to learn, I would usually have trouble putting down my unclass project work to take care of my other homework."*

The ambiguous nature of how much work should go into a contract was the source of frustration for students. One student describes the initial disorganization and lack of set expectation: *"We didn't have any initial standard to set our projects to. I wasn't sure if I had to build something huge to be considered complete, and I wasn't sure what was expected of the presentations. I chalk all of that up to a learning experience though. I wasn't given a ceiling so I was inclined to take my projects as far as I could, primarily because they were fun."* This quote raises an interesting research question: If students are allowed to set a learning contract for a course, do they do more “work” than if they were to follow a syllabus set by an instructor?

2. Students Incorporate Feedback into Proposals

Students post their learning contract to the class website to elicit feedback from the instructor and other students. This enables other students to see and learn from the feedback from the instructor, and be able to respond as to the feasibility of each project. It also allows for the possible recruitment of other students to participate in the learning contract. Once the contract is revised, the instructor approves the project and the students’ grade is bound to the satisfactory completion of the project.

3. Contract fulfillment

Students work individually or in teams to complete their learning contracts. They are challenged with the task of finding their own learning resources, and may ask the instructor and other students for direction. This is seen as a key feature of the design. As students find their own learning resources they are able to select resources that they find most helpful. Research suggests that students and experts possess different cognitive structures (Ericsson et al. 2006). Experts are able compare a new situation to what they have experienced before through pattern recognition and are then able to recognize nuances and focus on important, rather than unessential elements.

Novices do not yet have a rich experience base, and as such, learning is sequential (R. R. Hoffman et al. 1995). We suggest that as students possess similar cognitive architectures they are better able to relate to novices in their class and outside of their class. As the process of learning becomes “transparent” and open, using technology students are able to use resources created by other novices to grapple with new subjects.

What resources did the students use?

If, as we suggest, students are better able to learn from learning objects created by novices (instead of experts), allowing the students to incorporate and find their own learning objects is a logical design to a course. Yet, from our experience, doing this can be very difficult for teachers. Data from the students gave surprising results on what resources were used to complete projects, and how they were found.

We were surprised by how many students used social networks to find learning resources. One student remarked, *"Usually I would just start on a project, and when I came to the parts I didn't know as much about I would search using Google and talk to friends who I thought might be knowledgeable on the subject."* As the course progressed student's utilized the social network created through the class blog and wiki that was used to share knowledge that students had developed through the course of completing projects. This is illustrated through the following student comment.

"It was very helpful to use island and the respective blogs resulting from other student's completed projects as a resource for my projects. I could remember certain things that the other class members were doing from their projects and ask them questions via instant messaging or island [the course website]. Because the class members took ownership of their projects I found them all to be very knowledgable about the subjects they studied. This helped build a very nice knowledge base."

Another student mentioned other professors and students as well as people he had met on the internet through blogs as means through which he found educational resources. Most students mentioned that they contributed to the class blog as well as other student’s blogs, or their own blogs.

4. Share learning deliverable

Student’s share what they learn in two ways. First, they post it on the course website so that other students can read and comment on it. Second, they create an “ignite presentation” which consists of a 5 minute power point presentation of 20 slides in which the slides automatically advance every 15 seconds. This is intended to be a rapid way of transmitting ideas in an engaging and entertaining manner.

By making the student learning deliverables available publicly on the Internet, it encourages student accountability for learning, and creates marketing for the university or institution. As future students come to explore the college or university, they will be able to “lurk” and see the projects and potential colleagues that they would be working with. Resources that students then become learning objects used and built upon by others.

Assessment

Given the unusual nature of the class, assessment was handled differently. The majority (70%) of the points came from completely the contract as agreed upon in the learning contract. The remainders of the points were awarded for either extra work done on projects or where students helped other students in some way. This following is the assessment portion of the class syllabus:

70% of your grade will come from the completion of your project. Items to be graded include:

- Complete a contract that lists the work to be done (or learning to be achieved), the specific tasks or responsibilities of each student in the group, and any deliverables to be created.
- Complete an appropriately difficult project meeting the contract agreed upon
- Submit weekly progress updates
- Attendance at weekly group meetings

- Give an ignite presentation
- Attend and present at least one session at the twice per semester unconference

20% of your grade will come from Learning 2.0 points. These include things such as:

- Reviewing and making comments on other students' contracts
- Stories or blog posts to your project Island group
- Comments made on other users' stories, blog posts, and comments
- Other indicators of interactions and work

10% of your grade will come from Friend points.

These are points that others can give to you (the student). They are totally at the discretion of the owner of the points. The teacher has a number of friend points he can assign, and each student has friend points he or she can give. Each student will be given 10 friends points per project. These points must be given to other students during the project or they are lost.

Two students mentioned that the grading procedure was the worst part of the class: *"There was no fair assessment of the work we did." "The [biggest problem with the course] was trying to figure out a grading metric for the class."*

V. DISCUSSION

Many teachers fear moving to a more open, student-led classroom, as they fear that by giving up control, the students will not work and the class will slide into chaos. Teachers who teach in micro-lab environments will need to learn to think and act differently than they have before. The traditional classroom teacher strives to lessen complexity by reducing and simplifying interactions between students and with the teacher and by creating rigidly defined assignments with predetermined deliverables and strictly enforced due dates. Students in a micro-lab environment behave and learn in ways and toward aims that teachers and curriculum planners cannot predict and may not like.

A micro-labs class cannot avoid complexity and the accompanying uncertainty and unpredictability. A teacher in a micro-labs environment must realize that he/she cannot force good things to happen but can only create an environment from which good patterns can emerge. The micro-labs environment demands a different type of teacher, which we describe as "Teacher as Designer." To paraphrase Lao-tzu, the father of Taoism, the bad teacher is him who the students despise. The good teacher is him who the students praise. The great teacher is him who the students say, "We did it ourselves." A teacher-designer works quietly in the background gently structuring and molding the classroom environment.

We have found that the connections that form between students are just as valuable, over time, as any knowledge or skills the students learn. George Siemens helped lead a large (1000 students+) online course on the connectivism learning theory in Fall 2008. He reflected on the experience:

"The real value of the course was in fostering connections between learners and concepts. We haven't follow up to see if the networks formed during the course continue to exist. I'm aware of several clusters of learners that are still involved in dialogue on Twitter, some who are conducting research on the course, and others who are active in commenting on the blogs of learners they met in the course. For each of these learners, CCK08 was important not only for the content discussed, but for the relationships and connections that were formed and continue to provide a source of inspiration." (Siemens 2009)

Courses based on a Micro-labs design posit many benefits. In some universities, 50 percent of enrollment is concentrated in only 25 of the largest classes (Graham and Stacey 2002). This suggests the high financial cost of serving students in smaller niche classes, which can be reduced with the micro-lab design as one teacher can coach significantly more student-led learning teams and less building resources are needed. Self-adaptive learning benefits students, as they are able to learn the material in the manner, and with the resources of their choice. Students are also able to learn from and contribute to a community of practice in which they may later be employed.

VI. CONCLUSION

As nobody involved had prior experience managing this type of course, we were unsure what would unfold. We were pleased to watch the class become a success, see self-directed learning, and peer teaching. A strong social network was created which facilitated student learning by enabling students to access learning resources found through the community. This work can further curriculum design which allows students to learn in micro-lab environments and social networks, enabling them to find their own educational resources.

We recommend others to adapt these micro-lab principles into IS curriculum, by experimentation. Our experience tells us it most beneficial for students who have taken IS-core classes and feel like there are few or no courses offered which match their learning interests.

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