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Two cases of College Instructors' Application of Constructivist Principles

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Abstract

The experience of seven community college instructors was documented as they applied, for the first time, principles and characteristics of constructivist pedagogy to the design of learning activities. The instructors became a community of learners as they collaborated and shared their experiences among themselves. They reported improvements in the quality of the learning experienced by their students. They observed the development of negotiation, teamwork and management skills in their students as they actively participated in the learning activities. The participants indicated that the constructivist approaches they had learned would become instructional design tools they would use in other learning units.

Ideas related to constructivist learning design seem to be appearing with growing frequency within the broad dialogue on teaching and learning. While the ideas are not all new, interest appears to be developing in implementation within the design of structured learning experiences. I developed such an interest in learning more about how these ideas might work in learning environments I support at the New Brunswick Community College St. Andrews Campus.

I wanted to know more about the nature of learning, and how to use such knowledge to overcome deficiencies in the learning models I have used over my career. I was perplexed by the emerging use of technology in education. I could see some advantages of using computers and communication technologies as tools to bring learners together and as information caches to support the personal development process. However, I observed that early applications appeared to ignore the true needs of the learner in favour of the "gee whiz" abilities of the technology.

I suspected that the root difficulty to overcome, for educational technology to become effective, was to find a way to identify and fulfill a learner's need for relationship in learning. I knew from my own learning style that I did not truly learn something until I had the opportunity to validate the new concepts in context and in dialogue with others. This opportunity seemed to be missing in the computer mediated models I had observed.

I was looking for a concept that I could bring back to my College that would aid in the integration of technology into a truly effective learning model. I came across a published dialogue on constructivism (Duffy & Jonassen, 1992). The dialogue provided me with language to describe what I had grown to believe about learning throughout my career. My prior experience had been with an objectivist approach to program design. Solutions to and explanations for difficulties in objectivist design became apparent. I was certain that this information would help faculty to make substantial improvements to delivery approaches in most programs.

The constructivist theory appeared to be fundamental to all structured learning. It seemed to me that if an instructional designer had a good understanding of constructivism, any program designed by that person would likely be more effective, whether it be for traditional or technology-based delivery. Constructivist application seemed to have an intrinsic respect for the need for a strong multifaceted relationship paradigm among the learner, peers, facilitator, content and environment.

I wanted to introduce constructivism as a new approach to learning design in my own College. My Principal agreed that this was worth further study, and we developed a tentative plan to initiate a dialogue. The faculty had developed effective teaching approaches over numerous years. We wanted to be careful not to imply that past methods were "wrong". The approach we presented was intended to expand the educational "tool box." We wanted to encourage faculty members to revisit existing approaches to learning and identify topics that might be better suited to a constructivist methodology. We wanted our students and faculty to experience success with these new initiatives over time.

I saw this as an opportunity to be an agent of change within my College, to assist faculty to bring a qualitative improvement to our programs. If successful, this work has the potential to expand the horizons of many people, and result in significant improvement to the quality of our College's programs. This learning also provides a solid foundation upon which to build future distributed learning programs for both local and distance delivery.

The objectivist view holds that reality, and knowledge of it, is universal (Duffy & Jonassen, 1992). Any individual will learn ideas and concepts drawn from this universal set of knowledge as appropriate to his or her social group and/or occupation. In formal education, the learner is expected to develop an exact replica of these ideas as they are presented in a classroom. Tests and other evaluation instruments are used to measure how accurately the learner can replicate the ideas and concepts presented.

In some programs, many projects are individual and the participant performs solely as a beginning apprentice. This limits opportunity to learn to work as a team member resulting in lost

opportunities to develop teamwork or leadership skills. The student often has difficulty relating learning to work outside the classroom. In the literature, Bednar, Cunningham, Duffy and Perry (1991) reported "the reason that so much of what is learned in school fails to transfer to non-school environments, or even from one subject matter to another is due, in part, to the fact that the school context is so different from the non-school environment" (p. 26).

Constructivist Model of Program Development and Delivery

The constructivist model of cognitive development takes a different view of the nature of knowledge and reality than that held by proponents of the objectivist model. Constructivist principles hold that each learner builds or fabricates his or her own personal knowledge of reality through the development of personal constructs or ideas (Doolittle, 1999; Jonassen, 1991). These constructs are based upon personal observations, discoveries, experiences and interactions with both other individuals and the environment. All learners create a set of linked constructs that collectively constitute their worldview. Each person's worldview is coloured by the nature of his or her experiences and the context in which he or she learned a given set of knowledge. During the learning process each learner interprets new information based upon prior experience. Some new knowledge is received and accepted without amendment from influential peers or powerful members of the individual's social group. Some knowledge is constructed as distinct ideas derived through personal analysis of one's experiences and interactions with others. Other knowledge is derived through a dialectic resolution of conflicting ideas and experiences (Duffy & Jonassen, 1992).

The constructivist learning designer determines what system, process or model students will interact with as they construct their own personal understanding of an environment under study (Cunningham, 1992). Each discrete idea -- also called a schema, concept or relationship -- developed through direct observation or resolved through a synthesis of idiosyncratic, disparate or conflicting information, is known as a "construct." A constructivist believes that each learner builds or constructs his/her own understanding of how the world works through a dialectic process in which individuals test their constructed views and develop their ideas through interaction and dialogue with others (Duffy & Jonassen, 1992; Stacey, 1999). Each learner develops this understanding based upon the sum total of the information available, including his or her personal experience, interpersonal relationships and environment at the time a construct is created.

The constructivist view stresses that each student learns to construct multiple perspectives on an issue or system. She or he must attempt to see an issue from different vantage points. A central strategy for achieving multiple perspectives is to create a multidimensional, collaborative learning environment in which the views of other group members contribute to the alternative

perspectives that individuals can integrate with their own (Bednar, et al.,1991). The quality, depth and transferability of any construct depend upon the quality of the information and experience encountered by the learner. The constructivist believes that the most useful and transferable learning takes place when the learner is exposed to whole systems operating within real world, ambiguous, complex and often conflicting contexts. Authenticity in the constructs that are developed results from presenting a range of opportunities and challenges in which learners can assume different roles within the community and learn through interaction, observation and negotiation about how others perform their roles (Allen, 1992). The constructivist also believes that the learning environment should allow the learner to deal with actual problems or issues within real contexts and to work with real tools or models of the trade or profession. The learner is exposed to multiple points of view, from the perspective of those responsible for different aspects of the working system. The intricacy of the learning environment needs to be maintained in order for the learner to understand the complexity of the total system (Bednar, et al., 1991).

To help learners construct the knowledge and skills necessary for entry into a specific industry, the constructivist facilitator must provide conditions that replicate or model the complexity and ambiguity of real world contexts and problem solving methods used by experts within that industry. If the learning environment cannot fully replicate the industry model, the facilitator must provide the content that the learner cannot extract from the available environment. The facilitator must also provide linking or bridging information to assist the learner to link constructs to other models, or to systems that cannot be provided in the learning environment. In cases of purely conceptual learning, the facilitator must ensure that the learners have access to information and resources that will make discovery of the links among concepts logical and effective.

The constructivist facilitator expects that a learner, after experiencing this stimulating learning process, will have constructed a multidimensional understanding of the model or system under study. The student would then be able to seamlessly transfer skills and knowledge to a real life context from the learning context. For example, a student who is taught how to record meeting minutes by reading a manual may not learn when and how to modify learned procedures in real-world settings. A student who learns how to record meeting minutes by attending meetings, preparing a record, then comparing his or her results to the official minutes taken during the same meeting by an expert would probably learn skills more easily transferable to real-world settings.

The Study

Though initiated as a college professional development initiative, I took the opportunity to develop the plan into a documented action research study approved by the ethics committee and graduate

school of the University of New Brunswick. Dr. Dorothy MacKeracher and other members of the Faculty of Education provided valuable guidance and encouragement throughout the process.

The study documented the nature of the experience of a specific group of college educators attempting to initiate change in relation to a developing dialogue on constructivist learning. The study was designed to assisted these educators to determine if their efforts had been successful and/or worth repeating in whole or in part when next presenting or revising a learning program. The record of the process may encourage others to experiment with similar changes.

The study also documented the process of introducing the staff of a community college to a new approach to course design and implementation that may be significant for other educational institutions.

Constructivist Pedagogy

In the literature Constructivism is discussed as a philosophy, an epistemology and a pedagogy. Of greater interest to me than the fine distinctions among theoretical perspectives is the development of constructivist pedagogy. Various schema developed to support constructivist epistemology have used a set of characteristics that can be used to guide the construction of a learning environment that supports learning and the construction of meaning. They challenge instructional designers to create learning activities compatible with knowledge construction. Constructivist ideas promote the development of "novel classroom strategies aimed at increasing students' motivation to learn, locating the responsibility for the learning with the student and not primarily the teacher, and emphasizing class room communication and ways of learning. (McCarty & Schwandt, 2000, p.82).

"Constructivism does not claim to have made earth-shaking inventions in the area of education; it merely claims to provide a solid conceptual basis for some of the things that, until now, inspired teachers [did] without theoretical foundation" (von Glaserfeld, as cited in Murphy, 1997, p.2). Doolittle and Camp credit von Glaserfeld with three essential tenets of constructivism and add a fourth drawn from the work of other scholars. These four tenets are (Doolittle & Camp, 1999):

1. knowledge is not passively accumulated, but rather, is the result of active cognizing by the individual;
2. cognition is an adaptive process that functions to make an individual's behaviour more viable given a particular environment;
3. cognition organizes and makes sense of one's experience, and is not a process to render an accurate representation of reality; and

4. knowing has roots in both biological/neurological construction, and social, cultural, and language based interactions.

"Rather than being alone on a pedestal, the constructor of knowledge is a member of a sociocultural group from which he or she draws innumerable resources and obtains invaluable direction" (Phillips, 2000, p.viii). Vygotsky (1978, as cited in Stacey, 1999) proposed a theory of a "zone of proximal development," in which the group would contribute more to the learner's understanding than he or she is capable of constructing individually, particularly when the group is exposed to an environment that requires members to function just beyond their level of competence or comfort zone. Vygotsky believed that we think as a function of talking with our peers, with the discussion becoming internalized as thought, and ultimately socially constructed learning (Stacey, 1999). Truth or viability of knowledge is determined through an interactive dialogue and shared experience within a community of learners (Doolittle & Camp, 1999). Resnick (1996) states: "Cognition and intelligence are not properties of an individual person but rather arise from interactions of a person with the surrounding environment (including other people and artefacts)" (p.2). Knowing and learning are perceived as dialectical processes in which individuals test their constructed views on others and negotiate their ideas (Stacey, 1999).

From these four principles a number of important values and ideas emerge that can be used to guide the design of effective learning environments and learning objects (i.e., learning activities and learning resources). An example of such values is the role of relationship in learning. A good design will attempt to ensure that the learner has well-formed relationships with peers, the facilitator, the intended content, the learning objects, and the learning environment. Fahy (2000) advises educators: "Provide communication links among users, and design good reasons to use them" (p.8). If such relationships are present, the learners will have a rich opportunity to explore, test, experience and negotiate with their peers within an effective zone of proximal development (Stacey, 1999).

Constructivist Design Principles

Constructivist pedagogy is based upon a wide range of design principles. Doolittle and Camp (1999) provide eight constructivist design principles that they argue are core to the pedagogies developed by constructivists. These principles, listed in Figure 2., were compiled from and/or are supported by the work of other scholars.

"Constructivists emphasize the design of learning environments rather than instructional sequences" (Jonassen, 1994, p. 35). The constructivist designer can set the stage by placing a group of learners within a real or accurately simulated system drawn from some aspect of the real world under study (Figure 1, Principle A) (Jonassen, 1991, p. 11). Within the learning environment, the

facilitator serves, not only as an expert on content, but also as a guide who facilitates the learning by providing scaffolding or additional processes and supportive information as well as bridging or linking processes and information. (Figure 1, Principle G). The learners are then expected to engage in a challenging dialogue as they discover how the system works from the perspectives of various operators within the system (Figure 1, Principle H). Learners can assume the various roles called for as the system operates and collectively engage in "what if?" scenarios. They also test the system by manipulating the variables present to determine how each works independently or in concert to stabilize the system or contribute to its efficiency or output. The learning environment could provide a simulation of a real system (Jonassen, 1991) or might be located in a real facility such as might be found in a commercial kitchen, woodworking shop; a graphic design house or community newspaper (Figure 1, Principle A).

Alternately it may be possible to simulate only a portion of a system or to examine the system from the outside looking in. The learning objects, or designed learning activities, may include information about competing ideas or concepts that the learners are challenged to reconcile (Kanuka & Anderson, 1999). Formation of learner workgroups to collaboratively conduct research and analyse the findings or to build working models may be appropriate (Figure 1, Principle B). "Learning most naturally occurs, not in isolation but by teams of people working together to solve problems" (Jonassen, 1999, p. 228) (Figure 1, Principle B).

Many different activities may be designed that are based on one or more of the basic principles. The result is to provide access to learning resources and activities that enable the learners to collectively form a social or learning community, share experiences, and negotiate collective or personal meaning. The members of the community might construct their own personal approximations or viable solutions to the situations encountered, or might discover basic truths (Kanuka & Anderson, 1999). The learner constructs, examines and understands personal experience within the social context operating at that time and place, or within the zone of proximal development proposed by Vygotsky. "What is learned cannot be separated from how it is learned [and where it is learned]; suggesting that knowledge is not just within the individual, but [is] part of the entire context" (Kanuka & Anderson, 1999, p.12).

Ideally the learning community will generate information from several different perspectives. Learners will have opportunities to assume different roles in the operating system and encounter content within the different context of each role. This experience will encourage dialogue and debate among their peers. Working together, the learners will have opportunities to reconcile multiple interpretations of data and continually negotiate the meaning of experiences, data, hypotheses and observations. Members of the learning community will then construct systems of understanding that

are largely consistent with one another (Kanuka & Anderson, 1999).

Learners actively construct knowledge when they undertake an activity or create a product or artefact for delivery to the facilitator or the learning community. For example a learning activity in a welding shop might result in the production of a product such as a weather vane. Alternatively, a learning activity in a quality management course might result in the creation of an artefact such as a process control chart. The knowledge is solidified when learners are encouraged to reflect upon how they have constructed the experience (Kanuka & Anderson, 1999). Doolittle and Camp's (1999) consolidation of these ideas into eight constructivist design principles serve to inform the constructivist designer when determining how to set the context and establish the relationships to through which the planned learning can occur. Much of the literature documents specific applications of the principles of constructivism and the design principles proposed by Doolittle and Camp.

The educator does not have to adopt an "all or nothing" approach to constructivist pedagogy; but rather, can be a constructivist designer and use those components of constructivism that are viable given the knowledge and skills to be learned. Some of these components include (Savery & Duffy, 1995):

- Anchor all learning activities to a larger task or problem.
- Support the learner in developing ownership for the overall problem or task.
- Design an authentic task [requiring the same type of cognitive challenges to be found a real-world context].
- Design the task and the learning environment to reflect the complexity of the environment in which they should be able to function at the end of the learning.
- Give the learner ownership of the process used to develop a solution.
- Design the learning environment to support and challenge the learner's thinking.
- Encourage testing ideas against alternative views contexts.
- Provide opportunity for support and reflection on both the content learned and the learning process.

The resulting learning designs can be derived from a wide variety of sources and use innovative and adaptive organizational models.

The Action Research and Case Study Models of Inquiry

The model of inquiry adopted for this study is based on action research and the case study method. Action research is a process through which practitioners (e.g., teachers) can gain an experiential understanding of the effectiveness of their practices (Quigley, 1997). Quigley defines action research as a "self-reflective inquiry

undertaken by participants in a social situation in order to improve the rationality and justice of their own social practices, as well as their understanding of these practices and the situations in which these practices are carried out" (p.14).

This study involved documenting the experiences of seven practitioners (teachers) as they each carried out an action research project. Each project involved the design of a learning unit using constructivist principles and its implementation and evaluation. The experience of each practitioner was used to write a case study. Data were gathered through interviews with the researcher and documented observations of the activity of those involved. The seven cases were then analysed collectively using criteria derived from the literature with an emphasis on the design principles (Doolittle & Camp, 1999).

The use of case study method to conduct this study is appropriate because it allowed me to follow and document the action research projects engaged in by the seven participants in the study. The case study method is recommended when the activities being reported can be seen as distinct from other related activities and the phenomenon is to be investigated within a real-world context. Yin (1994) states, "the case study method allows an investigation to maintain the holistic and meaningful characteristics of real-life events" (p.14).

Case studies may take a variety of forms. They may involve the collection of qualitative or quantitative data or both. They may consist of single or multiple cases; may be selected for instrumental (practical exemplars of the issue under study) or intrinsic (exemplars that have unique qualities) reasons; and within each case, single or multiple units of analysis may be used (Stake, 1995; Yin, 1994). Case studies are not associated with any specific methods of data collection or data analysis. Rather the type of data to be collected and how they are analysed in each case study are defined by the research questions and the nature of the end product (Merriam, 1991). Case study research can be reported using a wide variety of formats limited only by the need to provide similar types of information for each case in the study.

The individual case units reported here are instrumental, selected because they illustrated the use of constructivist pedagogy by seven voluntary participants. Multiple units were selected to represent the variety of departmental workgroups within the overall case of the New Brunswick Community College.

Developing the Cases

The College presented a two-day professional development symposium with selected faculty members to introduce constructivist pedagogical theory for possible application in program design and delivery. During this symposium, we discussed issues related to

emerging trends in adult education, technology and supportive social structures, and to objectivist and constructivist theory.

Several weeks later, we presented these ideas to the entire College staff. The faculty endorsed the concept of moving forward with applying constructivist methods to selected learning units within regular courses in order to test the effectiveness of these principles within the community college context.

Seven faculty members were invited to participate in this study. All volunteered to take part. Each participant designed and delivered a learning unit based on constructivist principles. The experience of each participant was documented during interviews and a case narrative was developed and analysed. I have presented summaries of two of the case narratives as representative of the study results.

The Case of W. S. Wordsmith

W. S. Wordsmith is responsible for the delivery of a communication course in which the students were expected to learn how to organize, conduct and document formal meetings. This included preparing meeting agenda and notices of meeting, taking minutes, and conducting meetings following Roberts' Rules of Order.

Wordsmith had delivered this course a few years earlier and had not enjoyed the experience. Using an objectivist approach, she had organized the course for her students entirely by herself. She had spent a lot of time contacting community groups to arrange for each student to attend a formal meeting and observe how it was conducted. She had had to do a great deal of hand-holding to help students overcome fears related to low levels of self-confidence about attending such meetings. She found that she was exhausted at the end of the course, without a sense of accomplishment. She had covered the material but was not confident her students could apply the learning in an actual situation. She immediately saw a dual benefit of transferring organizational responsibility for the learning activities to the students because this action would help the students to gain a sense of control over their own learning environment and would significantly reduce the amount of her preparation time.

The course began with a class meeting, during which Wordsmith outlined the objectives established for the program. She explained that each student would need to learn how to organize, conduct and document a meeting in a professional manner according to Roberts Rules of Order. Wordsmith then led the group in a brainstorming session to create a list of possible activities, following which they negotiated the activities they would undertake to gain this experience. The group decided that they would work in pairs and each pair would attend a real meeting in the community. Each student would take a set of unofficial minutes of that meeting to present to the class. Wordsmith reported: "I suggested that each student pair with someone who had community connections, if she or he did not, to

make it easier to find a suitable meeting for the assignment."

Students who thought that they had a community contact were asked to raise their hands. Those who did not raise their hand "were asked to use their interpersonal skills to team up with" a student who had raised their hand. The more mature or experienced students were the ones with community contacts. This worked well in that the students requiring more support were paired with students who were better equipped to provide that support. Wordsmith had not thought of that aspect in advance but was pleased with the result.

A number of preparatory activities were identified for completion before the main activity was begun. Each pair of students was asked to use their community contacts to find a set of minutes they could bring back for comparison with others for content and format. Places that would likely share or not share their minutes were identified and reasons why where discussed. Some sets of minutes brought to the class by students were compared with those provided in a standards manual.

Meetings were held within the class at which a chairperson was appointed; the class was then conducted as a formal meeting. "I chaired the first and students took turns chairing and organizing each following [class] meeting." Each student pair prepared a short report. The presentation of these reports formed the basis for minute taking in the in-class meetings. Motions were made on when assignments would be due, so that they all gained experience in recording things verbatim. Each student was required to prepare an agenda for every class meeting, and they each took minutes. Minutes were traded back and forth among the group and students provided feedback to the author of the set of minutes they reviewed.

> They have collectively gone to town council meetings in the local area, to school type meetings, an SPCA meeting, government meetings, student government meetings.... This approach can drag on and be more time consuming because you can't cover something in a neat little package. The meeting dates were spread out over a long period of time. I still think that the hands-on and the community networking were good for the students. To get out and shake someone's hand, and make contact with the community was in itself a good thing. The whole activity was a good experience for the student....

Wordsmith reported that the experience gained from creating the practice sets of minutes from internal class meetings was very beneficial.

> The students were surprised how close to the real thing these practice meetings were. I think it gave value back to what they were doing when they saw it in real life. It

> was not just your instructor telling you anymore. It gave me credibility when classroom activity was validated out in the community.

Wordsmith was surprised that she did not receive any complaints about doing these activities.

> No car troubles [or] babysitting issues were brought up. They had been a problem before when assigning evening activities... When I tried this before from a conventional perspective, it was just impossible with rumblings and discontent.... They were made responsible this time. There was a higher level of buy-in this time... Students had not felt the need to make excuses to avoid participating.

Wordsmith thought that her students had developed a real understanding of how to prepare meeting minutes.

> If I had just given a handout and said, 'Look, this is the way this is done', or said, 'Let's turn to such and such a page.' I don't think the depth of understanding would be nearly as great...I think that the core was for the student to learn though discovery. When they discovered things on their own it stuck with them. I think hooking into reality was an important factor. Building on little pieces of knowledge they already had was essential. This was something that they will remember learning.

She also observed that the learning activities promoted self-confidence.

> The groups I tend to teach lack confidence and have little opportunity to observe professional behaviour...This type of activity provided a context for them to make contact with professional people and realize that they had entered a professional arena...I think it helped build confidence.

Wordsmith commented that this professional contact was also a great self-marketing opportunity for finding that all-important first job after graduation. She thought that there was also a spin-off for the College, as it makes College students more visible in the community. She believes that it built better community awareness of the College program.

Wordsmith reported that she believed that the biggest risk with this approach was the worry that there could be strong resistance from the students to taking responsibility for organizing the activities. She reported that she would have been in trouble if she had had to take over responsibility, because the work for her would have been very time consuming and less effective. She thought it was important

that the locus of control was shifted to the students. "I wasn't going to just bail somebody; but if someone was running up against some legitimate roadblocks, I needed to be there as a support." She reported that she had to help only one pair of students to make a professional contact.

She reported that some students approached the wrong groups initially. "They learned to think through their decision to approach that group in the first place; they realized that not all meetings are, or should be, open to outsiders." There could have been a risk if the possibility of rejection had not been discussed. Developing a plan prevented them from feeling personally rejected when a group had to decline their request.

Wordsmith liked to see the students return to class able to share and discuss experiences. "When it was happening to one of them they can relate to what happened. The sharing when they have each 'done it' is better than each reading [resource material] and then sharing." She believed the project helped the students to feel a real sense of accomplishment. "I think that it proved to them that they were capable of going out and doing something 'real' in the community."

When the project was completed the students reported that they "thought it was a good thing" even though they were very apprehensive at the beginning of the project. Wordsmith reported that the course was well worth the investment of time and that she planned to "do it exactly the same way" next year. "It is nice to do a project, and you feel it has gone well; you feel you have met the objectives, and the students feel good about it. It is fresh; it is a good change."

The Case of C. S. Market

C. S. Market is responsible for facilitating a core course in business planning for four different class groups of students. Market wanted to design an activity that would induce her students to become instantly engaged with the issues that arise when developing a business concept into an actual plan of action. The constructivist approach appeared to be well suited to support this goal.

"I want them to develop a conceptual framework to which they can attach the many pieces of information and understanding they will acquire throughout the whole program."

Specifically Market designed an activity that she hoped would induce her students to discover the complexity of business planning through a group product development and problem solving process. When initially considering options for her design, she decided that the activity would meet the following criteria:

- require the students to do something that was familiar and comfortable;

- be appropriate for students from each of the three program options;
- be enjoyable by including a "fun" or creative element;
- draw the students through the full planning process;
- result in the production of a product;
- lead to the achievement of a terminal goal;
- include a profit motive, since the purpose of business is to make money;
- work in a short timeframe;
- provide just enough stress to drive the students to completion; and
- lead to a logically sound planning process that would result in success.

"Cookies are what I came up with. All three groups could do it. It would be fun by the nature of the product. It would not really be difficult, but it would require them to work through the process."

The students were organised into groups of four to six students. Each group was given two weeks to create and sell a product, in this case cookies, which would earn a minimum of ten dollars profit to be donated to the student government student assistance fund. Dubbed the "Cookie Challenge", they had to document the process they followed and submit a report. They were asked to address the following key aspects of their business process: marketing, human resources, communication, production, and finance. The class discussed each of these key aspects as a group over the term of the project.

Each student was also required to keep a journal documenting his or her personal experience in the group. "I have never asked my students to keep a journal before, it is really essential that as the students move though the planning process they each create a record of the journey." Market experienced some difficulties allowing her students to work independently.

> I am so used to telling them each step of the process. It would be too easy to simply tell them to do each step in order. I guess the risk for me was losing control, or having no control.... I liked to walk into class and know what I was doing from the time I began until the time I left the room.

Market also found it difficult to plan for facilitating fifteen to twenty groups of four to six student each, all approaching the activity from differing perspectives. She worried about not having control over the outcomes. "I always wanted the outcome to be positive. I wanted the students to feel good about what they accomplished." She was concerned that some students might have focused only on the ten-dollar profit objective and missed the learning potential of the process development and planning aspect of the project.

For some topics Market gave a short presentation; for example, a presentation on "food costing to plan production of their cookies." They were directed to other resources for sample planning models and they were encouraged to consult with other faculty members in addition to Market. The students had to use their own time and resources and had "full ownership of the results."

> Students were actually doing it themselves; they were working through and saw that it may not be as easy to work with the group as they may have thought it was going to be. They had to establish leadership within the groups. How would the group dynamics work? Could the group fire a student who is not performing?

Market believes that her students will remember this learning activity long after they have graduated:

> As opposed to them remembering me in ten years, they will remember the "cookie project" because they had to do it. They will remember when they go into business themselves as employees or employers. They will remember resolving issues as they arose. The learning will be long-term learning for the students. They will remember it a lot longer than I will."

Market consulted with colleagues, also participating in this study, when deciding how to divide her 78 students into four viable work groups, how to organize the activity, decide what information and resources to provide, and how to evaluate the results. She discovered that her colleagues were supportive of the project. She particularly enjoyed working with the two other faculty members in her department that were also taking part in the study. She found it to be a personal developmental experience to share the learning design activities with them.

Market decided that each 90-minute class would begin with a short "mini-lecture", and then allow the class to break into groups. She wanted to provide just enough information to stimulate thought, research and discussion. She wanted each student to draw upon previous "experience as a consumer and previous work experience. They may not have made the link about how various business processes work together, but they will have at least some awareness as a starting point."

Market decided to assign a grade based upon a formative assessment of the student journals and a summative assessment of the final project report. "It was fun for all of us!" The students worked using their own prior knowledge and information they could draw from the learning environment. As the first activity of the year, relationships had to be created. "Almost every morning I had a cookie on my desk... for 'Quality Control'".

Market's relationship with the students was new; she found that a healthy relationship with the group developed more quickly than in the past. She found this to be a very important, yet unexpected outcome.

> At first I was afraid that they would think I had abandoned them. The "cookie challenge" concept seemed to package a complex project into an activity that appeared fun and easy to the students. Once they began the project they realized just how difficult it was. Something else without the "fun" element may not have worked so well. It was pretty light hearted throughout the project so it was a good opportunity for them to get to know me. This set the stage for a positive working relationship with my students throughout the year.

Market found that the project achieved its objective of providing a foundation upon which she and the student could build. They had developed, based upon their own knowledge, a common bond of shared experience that she and others could use as a starting point for the work that followed.

Market also noted that the teamwork skills developed were important in their own right. She reported that some of the students took creative approaches to the business structures. For example, she required them to include labour cost calculations in their production costs. Some groups responded with a sales-based commission structure as a more cost effective way to share the risks associated with the cost of production. Some groups did more than expected in terms of documentation of the planning processes. The total student donation to the student emergency fund was twice the amount that she expected.

Market was impressed with the quality of the student journals. She liked providing feedback in the journals.

> This took care of some of my perceived need for control. I could, in my comments, reflect back to them any concerns I had about things missed or not well articulated in the journals. The journals were a building process ... they added to them, as they constructed their learning. It was interesting to see, through the journals, how the thought processes evolved for each student. Some grasped the business concepts being explored right away, while others were quite far into the project before the significance of their work in terms of business processes became clear.

For the next year, Market has planned to further develop the project, to provide for clearer links to future curriculum material; to work consciously on the relationship building factor; and "to do a better job on the debriefing and consolidation of the learning at the

end of the project." She is still struggling with evaluation issues:

> From the old school, you give them so much material, they learn, they do, and then you give them a test of some kind to see how much they have learned. With the constructivist type of model they are learning at their own level. Though you are trying to get them to learn and progress in the same direction, time is recognised as a variable in the learning model.

Market reported that she found the old lecture format easier to mange because of the limits placed upon the content.

> In the constructivist model, anything that is learned is respected. They are learning and improving on anything they know. Setting the minimum acceptable standard and evaluating the learning against the standard seems more difficult. The evaluation process under a constructivist model is a concern for me. They can do a report, I can see a report, I can evaluate the output against what I have asked the students to address and give them a mark for it. In terms of constructivist theory, the summative evaluation may not be an important element; the learning experience is the important outcome.

Market found evaluation to be less complex when the learning activity resulted in some form of creation or output like a report. The journals proved to be an effective tool to both gain insight into each student's construction of knowledge and as objective evidence of learning that could be evaluated.

> I can see other possible applications that would be more difficult to determine a mark, other than a subjective observation of the student's activity. That may be acceptable, depending on circumstances. Maybe a constructivist activity can be pass/fail, you completed the experience or you did not.

Market was already considering what she might do differently next year to further improve her instructional design. She was considering assigning a summative report, or an open ended essay question like, "What did you learn from this experience?"

> Not being absolutely certain that the learning expected did take place is one of the risks I have taken with this project. I have a feeling that it was effective; I have a sense that a lot of learning took place; and it was the type of learning that I expected to take place. But is a good feeling enough?

Market has since worked through most of these issues and is

now using a constructivist approach in several other courses.

> I am into two other units currently that I am doing with a constructivist approach and I have a third in planning right now. I am finding that if I use a project-based evaluation and provide a good project specification that outlines the expected output, I am comfortable with the process. In some cases, formal objective testing still works.

Market reported that her first experience, the one being documented, was uncomfortable for her. She had not worked out how to "attach any value to the student experience."

> How do you measure experiential learning? How do we measure that? The system requires that we tack something on there an "A" or a "B", or a "60" or a "90". How do you do that?

Market found ways to resolve critical risks, and her sense of "loss of control" by establishing checkpoints or submission requirements at each key stage of the project. She could determine if the workgroup was functioning effectively or needed any intervention. She found a sense of balance she could accept.

> I have done two concurrent, very successful, constructivist activities since that first one. The students grabbed onto both of them and took off. I was initially a little worried that either activity may not work. I assisted them in forming workgroups and gave them clear parameters of expected outputs. I allowed them to develop and document their own work plans and timelines for each output, but that each output has to be handed in on time.

Further development was already taking place. Market was working with number of faculty members on redesigning a key component of the program from a constructivist approach.

> We actively looked for validation that our design was constructivist in approach. Did our design respect the need for each student to become actively involved in his or her learning? Did our approach effectively use the faculty role as a resource to the learning activities? As far as looking at current and future development of courses we plan to keep on doing that. This model gives us a tool to use in working collaboratively as a faculty team in integrating the learning from various courses. We could not responsibly do anything else after seeing the real benefit that is there for the student.

This suggests that the participating faculty members themselves

may have themselves become a community of learners, negotiating meaning with one another as they jointly develop their program delivery model.

Study Findings

The preceding narratives of the two representative cases presented describe the nature of the experience of the study participants. The resulting analysis of all seven cases concluded that the principles and characteristics of constructivist learning were well represented in each of the cases developed for this study. The validity of the study is restricted to the cases themselves. Given the encouraging results, other educators may wish to test the application of these ideas to their learning designs.

Figure 1 Eight Constructivist Design Principles

A. Learning should take place in authentic and real-world environments.
B. Learning should involve social negotiation and mediation.
C. Content and skills should be made relevant to the learner.
D. Content and skills should be understood within the framework of the learner's prior knowledge.
E. Students should be assessed formatively, [with feedback] serving to inform future learning experiences.
F. Students should be encouraged to become self-regulatory, self-mediated, and self-aware.
G. Teachers [should] serve primarily as guides and facilitators of learning.
H. Teachers should provide for and encourage multiple perspectives and representations of content.

Source: Doolittle & Camp,1999

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