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Teaching and Learning Theory: Who Needs It?

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Integrating technology into the classroom and using the Internet for learning are now the norm in community colleges. Instructors are busy developing online resources and using them either in conjunction with traditional classes or in online courses. While this implementation surges ahead, how can teachers learn to use the online environment for the optimum benefit of learners? Instructors can maximize the potential of these tools if they understand and apply the principles of modern learning theory.

Why do instructors need theory?

In community colleges, where teaching degrees are not required, teachers often have little or no awareness of learning theory. If they attend in-service teacher training, they normally will be exposed to an eclectic collection of approaches. Among the ideas introduced during in-service efforts, adult learning theory enjoys a prominent place, and this theory is helpful in addressing motivational issues, e.g., the adult's need to be self-directing. In addition, concepts such as "learning styles," "multiple intelligences" and "team learning" are common topics of discussion and they address important aspects of learning. However, this pot-pourri of concepts falls short of providing a cohesive, all-encompassing base for teaching activity.

In every discipline, researchers seek a fundamental explanatory theory that explains phenomena and guides action. For teachers, such a theory is essential to define the end goal of teaching and to unite goals with methods. Without a comprehensive theory, teachers must rely on their own experience as students and, if they feel the need for more direction, must cast about among a plethora of ideas for effective learning strategies and tools.

Where do we turn for a strong theoretical basis?

For over ten years, the concept of "learner-centred education" has been promoted as a guiding principle for improving community college education across North America (Association of Colleges of Applied Arts and Technology, 1995; O'Banion, 1996; Flynn, 2003). This concept promises the comprehensive vision that is needed, but can live up to its promise only if appropriate theoretical foundations are fully defined and applied. A crusader for reform in the community colleges, O'Banion (1996) called the movement "a learning revolution that aims toward creating a new culture and a new architecture of education, a new system in which the learner is placed at the center of everything that occurs in the educational enterprise" (p. 1).

According to O'Banion, four of the key characteristics of a learner-centred college are the following:

The learning college engages learners as full partners in the learning process, assuming primary responsibility for their own choices.

The learning college creates and offers as many options for learning as possible.

The learning college assists learners to form and participate in collaborative learning activities.

The learning college defines the roles of learning facilitators by the needs of the learners. (p.3)

The first three principles are reasonably clear and derive from adult learning theory, but the fourth is not a simple matter. What are the "needs of the learners" and how do college teachers match their use of technology to these needs?

Cognitive scientists are engaged in the continuing search for the mechanics of learning. Among them, neurocognitive researchers have advanced our understanding of brain function and have proposed biological theories of learning. For instance, Crick (1994) has studied neural networks in the hope of establishing a biologically based theory of consciousness. Although these theories are not yet at the point of fully explaining the complexities of learning (Sylwester, 1995), we may derive guidance from cognitive science in defining learners' needs in postsecondary education. With its roots in cognitive science, constructivist theory adds explanatory power. While adult learning addresses age-specific motivational factors in learning, constructivism addresses the fundamental nature of learning processes. Both theories emphasize the learner's active role in the learning process, and together provide a firm foundation for "learner-centred practice" in post-secondary institutions.

Adult Education Theory

Since the 1920's, proponents of adult learning have stressed the importance of self-direction, experiential learning, and individual differences. Knowles (1984) used the term "andragogy" to denote educational practice that acknowledges the responsibility of the adult learner for his/her own learning. Knowles summarized the principles of adult learning as follows:

Adults are motivated to learn as they experience needs and interests that learning will satisfy; therefore, these are the appropriate starting points for organizing adult learning activities.

Adults' orientation to learning is life-centred; therefore, the

appropriate units for organizing adult learning are life situations, not subjects.

Experience is the richest resource for adults' learning; therefore, the core methodology of adult education is the analysis of experience.

Adults have a deep need to be self-directing; therefore, the role of the teacher is to engage in a process of mutual inquiry with them rather than to transmit his or her knowledge to them and then evaluate their conformity.

Individual differences among people increase with age; therefore, adult education must make optimal provision for differences in style, time, place, and pace of learning. (Knowles, 1984, p.31)

Adult learning theory provides guidance for post-secondary instructors by placing control of learning in the students' hands and addressing the motivation of adult learners. Constructivist theory adds considerably to our understanding by addressing the learner's mental processes and the skills that must be developed.

Constructivism

In the past few decades, constructivism has become a major influence in elementary education. At the centre of constructivism, Piaget's theory of child development holds that the learner relates new experiences to previous experience and thus continually revises his/her understanding of the world (Piaget, 1970). One of Piaget's fundamental principles is that we construct knowledge through interaction with the environment.

Piaget's thinking parallels that of other cognitive researchers, Early in the twentieth century, American functionalists conceived of learning as transactions between the organism and its environment (Bredo, 1997). These scientists advocated learning activities that enhance the learner's ability to extract meaning from experiences and apply that meaning to new experiences. One of the best known of the early functionalists, Dewey (1916) viewed the continuous interaction of the learner and the environment as the process that leads to learning. Dewey emphasized that, as we perform an action, we are both learning about the environment and continuously altering it, and are therefore to a large extent in control of our own learning.

Throughout the functionalist school, the idea of learner as both actor and inter-actor was seminal. Building on Dewey's work, Mead (1956) increased the emphasis on the social environment. Mead elucidated how the behaviour of others signals to us the meaning of our own behaviour so that we become aware of its consequences, thus making social interaction the foundation of reflective intelligence.

On the other side of the world, Socio-cultural theorist Vygotsky (1978) mirrored the early functionalists' emphasis on the learner's interaction with the social environment as the foundation for higher order thinking and problem solving. Vygotsky's influential theory explains learning as a communicative process, integrated with language acquisition from birth. According to Vygotsky, we learn by communicating our thoughts and receiving feedback. Consequently, a key concept in social constructivism is the importance of interaction among learners. Applied in educational settings, this theory brings an emphasis on peer collaboration, questioning, students bringing knowledge to class, teacher co-learning and joint knowledge construction (Bonk & Kim, 1998).

While constructivism was taking shape, behaviourism grew to dominate educational practice in the middle of the 20th century. Behavioural scientists took functionalist learning theory in the direction of the learner's environment, downplaying the active role of the learner in the learning process. This influential movement established a model that ignored the learner's inner processes, concerning itself with observable behaviour only (Bredo, 1997; Pressley & McCormick, 1995; Shuell, 1986). The behaviourist model of learning concentrated on how observable behaviour can be externally controlled rather than on the learner's intentional learning and active problem solving.

Applying behaviourist theory education resulted in a strong focus on promoting teacher behaviour intended to bring about learning. Jones and Brader-Araje (2002) recall their experience as teachers working in public schools when all teachers in their region were required to participate in two behaviourist-based programs. The first program trained teachers in "effective behaviors" such as wait-time of four seconds after posing questions. The second program evaluated these behaviors. The authors state:

It became commonly know that the teacher could exhibit the desired behaviours, get good ratings on the instrument and the corresponding positive evaluation by the principal, but not necessarily teach a lesson where students developed meaningful understandings. Teachers knew that the programs failed to explain why students weren't learning and why instruction wasn't effective. (p.2)

In spite of the pervasive influence of behaviorism, and partially in reaction to it, modern cognitivist researchers have continued to pursue an understanding of complex mental processes. These processes include the formation of rules and the understanding of relationships among many different pieces of information, along with the problem solving that depends upon such knowledge. In his 1986 summary of research in cognitive psychology, Shuell noted that cognitive approaches focus more on changing the learner, for example, encouraging the learner to use learning strategies. Indeed, the learner's use of strategies is central to cognitivist view of knowledge. Shuell (1986) concluded from his review of the cognitive

research literature:

Learning is active, constructive, cumulative, and goal-oriented.... Without taking away from the important role played by the teacher, it is helpful to remember that what the student does is actually more important in determining what is learned than what the teacher does. (p.429)

Cognitive science places the learner at the center of the teaching/learning process. The following taxonomy defines the learner's role:

Declarative knowledge: facts, concepts and vocabulary stored in memory. A student must identify information that is important and then use strategies to hold and fit the information into previous knowledge structures

Procedural knowledge: the intentional use of cognitive tools such as analysis, application, synthesis, evaluation

Strategic knowledge: knowing how and when to use declarative and procedural knowledge to solve problems, think critically, and approach novel tasks (Phye, 1997, p. 54).

This taxonomy of thinking skills has important implications for teachers of students at all levels. Classrooms and online environments alike are greatly enriched by learning goals that emphasize procedural and strategic knowledge.

Building on cognitive science's explication of thinking processes, modern constructivist theory incorporates the important role of motivation in learning. Constructivists recognize that cognition does not occur in isolation from volition. The constructivist view of the learning process may be summarized as "an adaptive function with reference to the prevailing motivation of the student" (Phye, 1997, p. 595).

A motivated student encounters a problem situation and (1) exhibits persistent goal-oriented activity involving (2) the construction of varied domain-specific strategies and procedures that (3) result in a problem solution. On again encountering the problem situation or similar problem situation, the student demonstrates an adequate solution. (Phye, 1997, p. 596)

Phye concluded that the teacher's role in the learning process is to establish motivating conditions, create problem situations, foster acquisition and retrieval of prior knowledge, and emphasize learning to learn.

How can theory inform practice in the colleges?

When constructivist theory is added to adult learning theory, the result is comprehensive foundation for teaching at the post-secondary level. Without a full understanding of modern learning theory, postsecondary instructors are left to their own resources. Since teacher training is not required of instructors entering the system, the predominance of behaviourism in the twentieth century means that we have generations of instructors who know nothing else. Research suggests that instructors do not move easily into learner-centred practices. Examinations of community college teachers' adoption of instructional technology (Parisot, 1995, Thorpe, 1997) suggested that college instructors are strongly teacher-centred and tend to adapt innovations to their preferred style. Thorpe concluded that community college faculty do not have enough time or awareness of educational theory to develop the skills and understanding necessary for the effective application of computer technology.

Some insight into college faculty development may be gained from my study (Frank, 2000) where I investigated how community college faculty's perceptions of their role might have changed as they implemented Internet technology. During in-depth interviews, ten instructors talked about their awareness of learning theory, their beliefs about learning, and their instructional strategies.

The results of the study indicated that the online environment facilitated more learner-centred methods, especially for instructors who had constructivist or adult learning theory backgrounds. For those who experienced the most profound change, familiarity with learning theory was an important foundation. This familiarity had been acquired mainly through advanced degrees in education and, to some extent, informally through reading, personal contacts, in-service training, and workshops. Although the ten participants were selected on the single criterion of involvement with online learning, four had graduate degrees in education, one had a bachelor's degree in adult education, and three had otherwise actively pursued professional development in learning theory. The following quotations illustrate the importance that some of the participants placed on theory:

I've always self taught avidly. I mean I continue to read in this area, I continue to try to keep up to date in what's happening, the latest theories. And a lot of that is because I'm trying to find out what I really think and what my style is, both teaching and learning.... I think in assignments, in knowledge evaluation, particularly at the college level, we are very often stuck at the Bloom's Taxonomy very bottom levels of rote learning. And we need to understand that what the world needs now is synthesis.

I'm locked into certain grading structures because of the program. And we do have an external regulatory body that says we must. So I actually wrote a paper on this for my ed. psych., "How to be constructivist in an objectivist

environment."

I had trained my employees over 20 years when I worked in business. And I've just mushroomed from there and taken courses and whatnot, got my teacher's certificate. Actually, it's really interesting that when I took the [adult teaching and training] teaching course, it just solidified in me all those things that I was doing right, and it showed me areas where I could improve myself or things that I wasn't quite doing correctly. Personally I believe that an instructor, particularly with a Web site, or just building a traditional classroom environment, you have to sit down, you have to plan things out.... But I think what's very important is that a teacher can become stale. You must continue to educate yourself. And I'm not saying go and get more degrees, I'm saying more on understanding teaching methods and understanding how people think

Some participants reported that the online environment led to a sense of greater congruence between their teaching methods and beliefs acquired through previous exposure to learning theory. They had initially chosen the online medium on the basis of its potential for flexibility and active learning and they had not been disappointed in this respect. Here is an observation made by an instructor who had obtained a Master's degree in education several years earlier:

Guiding the students, showing them how to get the information sounds great in theory, but trying to apply it is rather difficult and now with the advent of computers and the ease of this whole thing it's much more conducive -- to where I would have liked to have gone but I couldn't get there because I wasn't sure how to get there. Now, with the technology it's allowing me to explore that area and go there.

This perception of greater congruence and improved teaching was similar to that found in an earlier study by Sleightholm Cairns (1993) among university professors who conducted online courses via conferencing software. Cairns' participants reported that they were enabled to teach in a more learner-centred style to which they had paid only lip service before.

The participants in the 1997 study (Frank) described online learning as empowering for students as well as for themselves. They perceived the most valuable benefits to be facilitation of active learning, critical thinking, collaboration, and the development of confidence and lifelong learning habits. A common theme was the way in which the teacher is forced to give up the control that one has in a face-to-face environment and to re-examine the traditional role of content deliverer. The teachers who mentioned giving up control thought that this change was desirable and yet difficult to accomplish for most teachers, commenting on the resistance by many of their

colleagues to change their view of teaching.

One of the most interesting ideas expressed was the important role of learning theory in mentoring. Some of the participants in my study were coaching other instructors in the design of online materials and courses. These mentors regarded this mentoring role as an opportunity for influencing peers to improve their teaching, and some used the opportunity to guide peers toward a learner-centred philosophy and practice. Their sense of the necessity for theoretical foundations is evident in their comments:

Teachers come and they want to learn.... You know, what icons can I put up and that. But what they're not getting is the underlying pedagogy behind it all. You know, a bad teacher is a bad teacher. We talked about this before. A bad teacher's a bad teacher no matter where they are. And teacher centred stuff is teacher centred, only put on-line it's worse. But if you've got a good sort of active learning going on in the classroom then I think you can transfer that on-line.

In the courses that I've taught, this groupware one, they're a fairly self selected group, although some -- every semester let's say a third of them are very kind of linear lock step people who are initially pretty uncomfortable when they start to see the implications.... They were expecting it to be another tool to add to an existing bag of tricks. They didn't expect the bag to be revised.

What is your teaching philosophy? Make a statement of that. How are you going to adopt that into your use of technology? And I would say that that is of more importance than the technology itself, obviously. You've got to have that before you then decide what technology tools to use and how you're going to use them.

These comments underline the need for learning theory as a basis for college teachers' use of technology. Despite previous findings (Thorpe, 1997), it is apparent college teachers do sometimes have an awareness of learning theory and apply it to their use of technology.

Emerging from a behaviourist to constructivist paradigm is a big leap for some instructors, yet assimilating it is often a welcome, empowering experience. "Following the legacy of behaviourism, constructivism has been welcomed as a theory of knowing that more fully explains the complexity of the teaching-learning process" (Jones & Brader-Araje, 2002). Such appreciation was expressed by participants' comments in my recent online course on constructivist implementation of technology for Masters students in Education. Their comments, made in the course conference and in reflective papers, reveal the new confidence often felt by teachers when venturing into constructivist implementation of technology. The theme of discovering

a much-needed foundation for their work runs through their comments:

I had never thought of my own teaching as stemming from a "constructivist" theoretical base. It seems that since the beginning of my teaching career, people have focused on the either Board or Ministry directives with very little emphasis upon the individual's philosophy or pedagogical beliefs. It was refreshing to consider oneself as such a "master" of one's own domain in the forum provided. By allowing students the opportunity to read a variety of articles such as this one, we consider very closely the reasoning behind why we do what we do and how we do it. It was really empowering as a professional to be introduced to the concept and be able to apply it to our own practice.

Learning that has been done in this course has had a steep curve for me. There were times that I felt overwhelmed; many aspects of the course that excited me to seek new ways of implementing a different kind of learning in my school and in my classroom; and many directions in which my school and I were moving that were validated by discussions and readings within course. I will take them all with me and hopefully take my teaching to a new level. One where I can put in place at least some of the technologies, practices, and theories that we learned while I continue to grow both personally and as an educator.

I like constructivist theory because it allows me to integrate other theories I also feel strongly about such as multiple intelligences, experiential education, anti-discrimination and peace education. While teaching the mandated curriculum, creating a constructivist environment in the classroom facilitates great social development as well. Most importantly, I believe constructivism is powerful because it can lead to deep learning. I think constructivism recognizes that learning is really an individual interpreting experience and making it their own. They are integrating new knowledge into existing knowledge and in doing so struggling to determine what they understand. Constructivism means that learning is integrating, synthesizing, analyzing and applying. Constructivism means that learning is a process and not simply a product.

Just motivating a student a little will go a long way to hooking that student into learning. We can do this by teaching within a student's zone of proximal (Vygotsky) development and thereby ensuring that student experiences some success. When a student sees him or herself as a successful and capable person I think we

dramatically increase the motivation that student will have for the next task.

I think constructivism can be done in existing classrooms. It is not about the physical environment as much as the learning environment the teacher creates and students learn in. With grade 5 students for example colleagues and I created a constructivist based unit in which they were using their desks - it is more about the way the unit is introduced, and the fact that students are presented with opportunities to experiment with ideas and questions to form new knowledge than the fact that they are in a 'real' environment (this is at least my opinion of constructivism).

We fit perfectly into this constructivist learning environment with our attitudes and passion for learning and wanting to learn as much as possible about using this technology appropriately as a tool to teach our students with.

These teachers are expressing a deep appreciation for constructivism's comprehensive nature and its corresponding value as a fundamental guide to teaching. When combined with adult education principles, it forms a powerful basis for post-secondary instruction.

Students' experience in constructivist online courses

One of the favoured tools for learner-centred instruction is online discussion. If the course is structured appropriately, online discussion encourages students to use declarative, procedural, and strategic knowledge. Students need to remember information from readings (declarative level), analyze and evaluate both readings and other students' comments (procedural level), make choices about how, when and to whom to reply (strategic level), and synthesize responses that advance the discussion (procedural level).

Students' comments below show how an online discussion exercises the three levels of knowledge in an integrated way over an extended period of time. Note also how metacognition can develop as students experience the difference between written and oral interchange. Metacognition, closely related to strategic thinking, is "active monitoring and consequent regulation and orchestration" of one's own thinking (Flavell, 1976, p. 252).

I think that someone is more likely to think about what they are going to type rather than just lifting up their hand in class then spewing at the mouth. I think a constructive way to participate in an online discussion is to pick a topic that interests you and look what others have to say.

The most important thing I learned through these online discussions is to communicate effectively by not trying to

convey my emotions, but rather thinking logically and making clear and concise postings. Online discussions are effective for exchanging ideas because you have to take time to listen (read) the other person's point of view, and then you may take your time while you formulate a reply. This adds quality to the conversation and allows people time to properly articulate their thoughts. I was pleased with the level and depth of the participation from my classmates.

As I read along, the argument unfolds and I am able to see the level of critical thinking I am at, that if this were not online, I would not be able to. I often say in my head "this could be better stated this way or that way" or "that argument leads to this thought."

It was really neat to be able to voice our thoughts and opinions online. I, for one, find my words come out much more clearly when I write them down.

I feel that the choice of discussion medium is useful in eliminating unnecessary talk and focusing in on the issues. I found that through reading responses and opinions this way, people were forced to be more precise and that made for some very strong points of view.

The experience of these students depends on having a teacher who believes in a learner-centred process and takes the trouble to design the course using constructivist principles. Such a teacher ensures that all students are empowered to learn actively. In this case, the course was structured in a way that emphasized debate as the central feature of the course. Students were given class time and marks for joining the debate. Without such an incentive, there is a tendency for online discussion to resemble classroom interaction where the teacher and few students dominate the discussion. Here are comments from students about this online classroom environment:

I don't normally say too much in class and this was a way for me to get my ideas out there to the rest of the class. I believe I made a great contribution to the class and would hope to be in another class where this is done.

It shows that everyone has an opinion, not just a few who normally take hold of discussions when in person while the rest stay silent.

I am one of those people that likes to take in what everyone else has said in class, think about it my own time, and then share my opinions. That is why I found the online stuff to be very beneficial. It gave me time to think and there was no pressure to come up with a quick reply.

I preferred to listen in class because I didn't usually have an opinion until I had heard what everyone else had to say.

The most important thing I probably learned is that everyone has a story to tell and you never know what someone has gone through or experienced until they choose to share it with you.

When the environment is structured for everyone to be heard, participants exchange ideas and consider multiple perspectives. This careful structuring, along with other learner-centred strategies that an instructor might choose, culminates in empowerment of the students.

Empowerment in the online environment may be defined as:
the expectation and enabling of a student to take a visible and meaningful role in the electronic classroom.
Characteristics of empowerment are the courage to state an intellectual position, to support one's stand with well-constructed arguments, to be flexible enough to consider challenges to one's position, and to modify one's position as a result of dialogue with others. (Davie & Wells, 1991)

Regardless of the subject or discipline in which instructors are involved, the goal should be to develop these abilities, which students may then apply as both citizens and workers.

Conclusion

In the quest for creating learner-centred colleges, we must ensure that technology is being used to meet learners' needs. While we do not know everything about learning, we can apply the knowledge that cognitive science has given us to technology implementation. With this approach, the inherent advantages of the Internet can be greatly enhanced for students in post-secondary education.

On-line learning facilitates the principles of both adult education theory and constructivism by altering the time and space dimensions of traditional teaching. For example, on-line instruction accommodates an adult learner's need to have multiple options and to be flexible in terms of the style, time, place and pace of learning. The opportunity for a fluid and collaborative exchange of ideas has helped to make on-line discussions one of the most favoured tools for learner-centered instruction.

It is apparent that instructors, when they have the knowledge, can move to more learner-centred practice in their implementation of technology. Among the steps colleges must take in order to move from a teaching to learning paradigm, support for faculty development is a must. It is essential that this development incorporates a thorough knowledge of modern learning theory. Faculty development efforts should focus on the acquisition of this knowledge through advanced degrees in education and on the subsequent mentoring and in-service training that can be accomplished within the institution. Faculty's in-depth understanding of learning theory will be essential for the promotion of an on-line learner-centered environment.

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