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TOWARD SOCIAL CONSTRUCTIVISM: CHANGING THE CULTURE OF LEARNING IN SCHOOLS

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Abstract: The practice of schooling faces several challenges today. Amongst these are the quest for students achieving learning with deep understanding and the difficulty of ensuring that school-based learning adequately prepares students for a rapidly changing world where knowledge becomes quickly outdated. Against this backdrop, we examine the constructivist approach to learning and evaluate what it has to offer with respect to meeting the stated challenges. We then focus on social constructivism as a particular genre of constructivism and examine the important role that language plays in social constructivism. Next, we briefly describe MIND BRIDGES, a collaborative knowledge building system, developed to facilitate the social construction of knowledge. We describe some of our experiences gained in deploying MIND BRIDGES for classroom use in the domain of English Literature and examine the difficulties that need to be overcome to change traditional school practices and culture in favor of those that would foster social constructivistic learning.

1. THE PROBLEM

Educators increasingly recognize the need for students to learn with deep understanding so that whatever is learned is retained and contributes to usable knowledge. They also recognize that, in an era where inoformation explosion has become the norm, learning facts is not what matters most. Rather, learning to learn, acquiring the skills of independent thinking and reasoning, and inculcating a positive attitude to the need for life-long learning are what matter most.

Instruction and learning are conventionally thought of as occurring in the classroom, the basic unit of a prototypical school. Brooks & Brooks (1993) identify five problems that arise in traditional school settings. First, the predominant direction of communication flow in the classroom goes from the teacher to the students. Student-initiated questions and peer student interactions are atypical. Second, teachers tend to over-rely on textbooks and simply disseminate the information contained therein. Third, classrooms structurally discourage students from working together. Emphasis is placed on individual accomplishment and assessment on isolated tasks requiring low-level skills rather than higher-order thinking. Fourth, student thinking is undervalued. In general, teachers simply wish to determine whether students know the "right" answer to a question. Fifth, schooling is premised on the notion that there exists a fixed, objective world based on conventional understandings that the student must come to know.

In a schooling culture typified by the above description, students view success in school in terms of the attainment of performance rather than the attainment of learning. The emphasis on performance encourages them to stress the learning of techniques, rules, and rote memorization. The predominant outcome is poor recall of concepts over time, very little long-term understanding, and very little ability to apply what has been learned in situations where such learning could be usefully applied. It is not surprising, therefore, to

find authors like Gardner (1991) bemoaning the fact that even when schooling appears successful in relation to the purpose for which schools were designed, students who exhibit all the overt signs of success typically do not display an adequate understanding of the material and concepts with which they have been working.

2. CONSTRUCTIVISM

The basic premise of constructivism is elusively simple: as individuals, we construct our own understanding of the world around us. Weaknesses in traditional schooling systems stem from a lack of appreciation that effective human learning is based not so much on knowing, but rather understanding—a meaning-laden process (see, for example, Bruner, 1990). To learn with understanding, students must make sense of what they are studying by synthesizing new information and experience into existing mental structures that they already possess. Students also need to appreciate uncertainty, and they need to learn to inquire responsibly. This process is effortful and time-consuming. It does not reduce to one of simply encoding established truths in some mechanistic way. As Fosnot (1993) argues, "learning is not discovering more but interpreting through a different scheme or structure." In addition, the evaluation of understanding cannot be based on what students can repeat. Rather, it must be based on what they can generate, demonstrate, and exhibit.

Constructivism is not a theory of instruction; rather it is a theory of knowledge and of learning (Fosnot, 1996). It defines knowledge as being "temporary, developmental, socially and culturally mediated, and thus, non-objective. Learning from this perspective is understood as a self-regulated process of resolving inner cognitive conflicts that often become apparent through concrete experience, collaborative discourse, and reflection" (Fosnot in Preface to Brooks & Brooks, 1993, p. vii). In that constructivism recognizes the power of the environment to press for adaptation, the temporality of knowledge, and the existence of multiple selves behaving in consonance with the rules of various subcultures, Noddings (1990) argues that the constructivist position is really post-epistemological. Because it posits such a different relationship between knowledge and the "real" outside world, von Glaserfeld (1993) aptly states that constructivism is better viewed as a theory of knowing than as a theory of knowledge.

In practice, things are a little more complicated, and we must distinguish between two different constructivist viewpoints. The first viewpoint, *radical constructivism*, holds that students learn through a uniform sequence of internal reorganizations, each more encompassing and integrative than its predecessor (Prawat & Floden, 1994). To promote learning, the teacher tries to accelerate the pace of reorganization by helping students to examine the coherence of their current ways of thinking. Thus, the locus of mental activity is assumed to occur deep within the human mind. This viewpoint is consistent with the Piagetian notion of endogenous reconstruction of unstable exogenous acquisitions. For radical constructivists, the environment also plays a role in learning, albeit a negative one: it serves as a testbed for the coherence of built-up internal representations.

The second viewpoint, *social constructivism*, can be seen as based upon Deweyan transactional realism. Acts or events are seen as always unfolding in a context. Through dialectical processes involving interaction with the environment, learners wrestle to make stability of meaning prevail over the instability of real-world events (Dewey, 1925/1981). The state of indeterminacy associated with reality cannot be alleviated conclusively. It can only be interrupted temporarily as individuals carve out islands of meaning in their daily existence (Prawat & Floden, 1994).

Brooks & Brooks (1993) articulate the following potential benefits of adopting the (social) constructivist paradigm in educational settings:

- It frees students from the dreariness of fact-driven curricula and allows them to focus on large ideas.
- It places in students' hands the power to follow trails of interest, to make connections, to reformulate ideas, and to reach unique conclusions.
- It shares with students the important message that the world is a complex place in which multiple perspectives exist and that truth is often a matter of interpretation.
- It acknowledges that learning and the process of assessing learning are, at best, elusive and messy endeavors not easily managed.

It should be fairly evident that learning driven by the principles of social constructivism is better suited to the attainment of deep understanding and the inculcation within students of the independence and creativity of thought that we so highly value today.

3. SOCIAL CONSTRUCTIVISM AND THE ROLE OF LANGUAGE

The role of language in literate cognition is inescapable. Bruner (1990) argues that language is *constitutive* of cognition, not *additive*. Thus, it would be foolish to ignore how language is used for meaning making and how knowledge is constructed through language use.

Hayakawa & Hayakawa (1990) make a seminal contribution in distinguishing between *intensional* and *extensional* meaning. Briefly, the intensional meaning of a word or expression is that which is connoted in a person's head whenever the meaning is expressed using other words; that is, it is based on language. On the other hand, the extensional meaning of an utterance is that to which the utterance points (or refers to) in the physical world; it is based on our experience in the real world. Seen in this light, the quest for meaning and meaningfulness in human learning can never be attained if we operate entirely at the level of intensional meaning. Thus, I would never succeed in learning German (or any other natural language) if all I have to learn the language from is a German–German dictionary. There is no way to bootstrap the semantics of the words used in such a situation. Indeed, one might go further and assert that dictionaries don't contain meaning. They can't. At a literal level, all that dictionaries contain is carbon on paper. Meaning making through interpretation of the symbolic forms perceived in a dictionary is an entirely human cognitive activity. Words don't have meaning of themselves; rather, we *give* them meaning.

Following from the above, it should be evident that experiential grounding is essential for meaningful learning. Experience provides the extensional grounding for words and concepts, thus imbuing them with a rich semantics. Once some core set of concepts is so grounded, learning and reasoning can begin to operate at the intensional plane with language serving as the vehicle for negotiating meaning.

As Prawat & Floden (1994) elegantly argue, "Society, through its use of language and other artifacts, shapes the individual's view of reality. Through language, members of a discourse community learn to 'carve out' the world in similar ways; they develop similar 'anticipations' about external reality" (p. 44). Gergen (1995) also argues that all our propositional representations of things that we take to be true gain their legitimacy not by virtue of their capacities to map the world; rather, legitimacy arises through processes of social interchange. He further describes how (a) meaning in language is achieved through social interdependence, (b) meaning in language is context dependent, and (c) language

primarily serves communal functions. (See also Antonacci & Colasacco, 1995, for a lucid account of the dialogic nature of language.)

One might worry about the risk of social constructivism degenerating into pure subjectivism. Fortunately, social constructivism does not need to be entrapped in this quagmire. As a transactional realist, Dewey (1910/1981) emphasized that any attempt to test the validity of "anticipations" about external reality have to be viewed in strictly interactive terms. Living things and their environments are involved in a reciprocal *co-implicative* relationship (Varela, Thompson, & Rosch, 1991). Individuals, through a process of social construction, develop hypotheses that create expectations about the texture ad quality of events to which they refer. The subsequent realization (or lack thereof) of these expectations determines the "truth" of these hypotheses. However, there is nothing eternal about the truths that emerge as a result of this process for the criteria used to evaluate knowledge claims are themselves social products accepted for the present time by members of a discourse community. Such criteria are always subject to revision or change (Prawat & Floden, 1994).

4. MIND BRIDGES

If one accepts the thesis of social constructivism articulated thus far, it follows that a computer-based system that supports the articulatory and discourse processes so inherent in meaning construction and the quest for deep understanding would provide a very useful learning tool. A tool that supports exploratory talk for learning, that is, talk used to engage in understanding, to shape ideas and to express them for the purpose of testing out a new concept or idea (Antonacci & Colasacco, 1995), is especially valuable in science learning. Indeed, Lemke (1990) has argued that "Learning science means learning to *talk* science" (p. 1). In this learning approach, students are strongly encouraged to actively ask questions of themselves as well as of others, to make inquiries of group members, to make tentative statements rather than complete, definitive statements, to keep an open mind to new possibilities, and to deal with disagreements and differences through verbal clarification (Antonacci & Colasacco, 1995). In this manner, students participate in a community of learners. Learning occurs first on an interpsychological plane before concepts are assimilated and internalized on an intrapsychological plane (Vygotsky, 1978).

The externalization of inner thought processes through explicit articulation reifies what students think. It makes their thinking inspectable. Thus, in the context of learning about animal cells (the examples below are drawn from Glynn & Duit, 1995), the difference in depth of understanding between a student who says, "An animal cell is a thing in the blood. It keeps the animal alive somehow" and another student who says, "An animal cell is what the whole animal is made of. Every single part of an animal is made of cells. The cells contain and store energy and contain DNA" can be readily judged. Such articulations can also reveal the misconceptions held by students, such as when a student says, "An animal cell is the basic unit of life. The building block of tissues like an atom in science. It carries out jobs like respiration, carrying messages, getting food, making the body go."

In attempting to promote the same style and spirit of learning described above, we have developed a collaborative, multimedia knowledge building environment called MIND BRIDGES. The system allows students to express their thoughts on any subject matter in a threaded form of discussion. They can import text, pictures, sound, and digital movies in the creation of their articulations, called *messages*. Students can also directly record sounds and digital movies into their messages. The multimedia elements enhance the

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representational power of the ideas that can be expressed. All multimedia elements play back *in situ.*

Communication between students takes place in an asynchronous fashion based on a client–server distributed model. In addition to browsing and responding to threaded discussions, students can also perform keyword-based search to find relevant messages. Figure 1 below illustrates what it is like to read a message in MIND BRIDGES. A more complete description of MIND BRIDGES can be found in Chee (1996). The development of MIND BRIDGES was inspired by work on CSILE (Scardamalia & Bereiter, 1989).

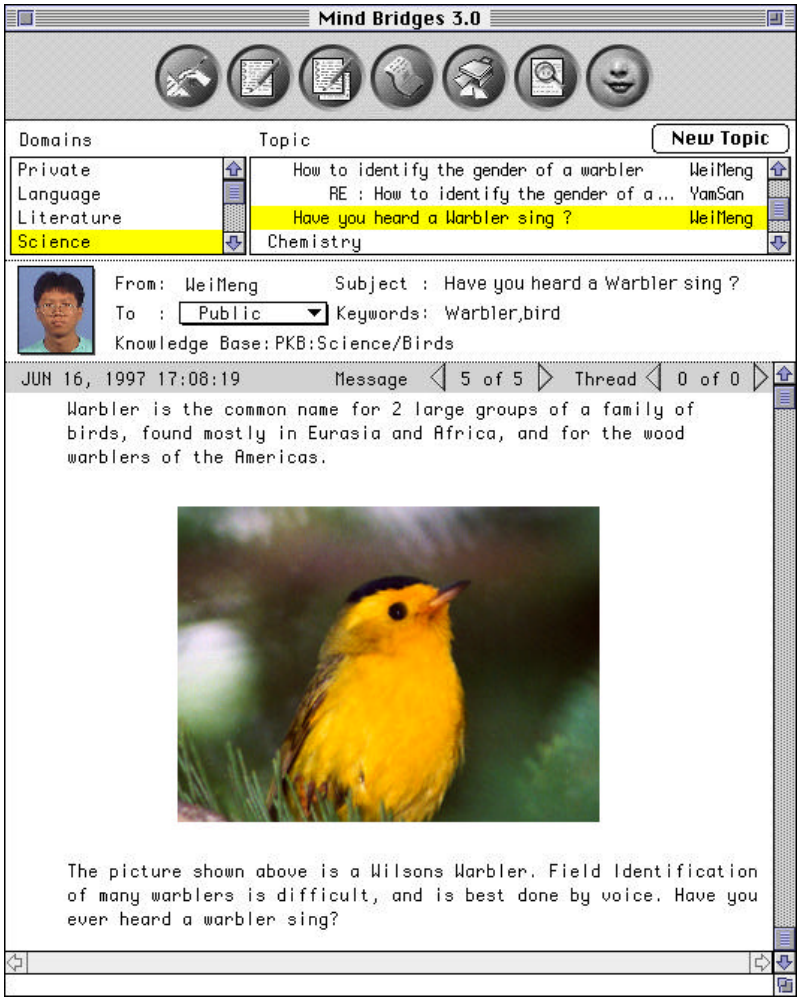

Figure 1: Reading a message in MIND BRIDGES

5. MIND BRIDGES IN USE

In this section, we give an overview of the use of an earlier version of MIND BRIDGES by students of two Secondary Three classes in the domain of English Literature. A more complete account of this empirical study can be found in Chee (1997).

Our study took place over the two half-year terms of 1996. During the first term, a class of somewhat weak students made use of MIND BRIDGES in the context of studying Shakespeare's play Macbeth. A motivating context was created by the teacher for the

project. Students were divided into two groups: the prosecution and the defence. These groups would cross swords at a courtroom trial of Macbeth to be held around the middle of the year. The task of the prosecution was to argue that Macbeth was guilty of killing King Duncan and deserved the death sentence; the task of the defence was to raise mitigating factors (eg. the role of his wife; the effect of supernatural elements) that would save Macbeth from the death sentence.

In the second half of the year, a second class of students at the same school was brought in to interact with the original Macbeth class. The new class comprised very capable students. It was hoped that the standard of the weak students would improve as a result of interacting with the brighter ones. The students were again divided into two groups—called Mulder and Scully—where the composition of each group included boys from both the good and weak classes. The task of the "Mulderites" was to demonstrate that Lady Macbeth was a fiend-like queen and part of a supernatural conspiracy responsible for Macbeth's killing of King Duncan. The task of the "Scullies," on the other hand, was to argue that the supernatural had nothing to do with the murder of King Duncan; rather it was Lady Macbeth who, as a warm and loving wife, supported Macbeth fully in his aspiration for the crown of Scotland. Toward the end of the school year, the two teams met in a live debate to present their respective arguments, and their presentation was judged by a panel of teachers from the school.

Due to the constraint on space, we will limit ourselves to highlighting some of the notable features of the students' discussions that took place using MIND BRIDGES. The protocols of the weaker students in the first half of the year manifested evidence of muddled thinking; for example, a student from the prosecution adopted the defence's position. There was a tendency on the part of some students to foreclose discussion, for example, with statements such as "There is nothing to debate about." Contributions had a tendency to be short (no more than five lines of text) and somewhat opinionated. In general, we found that students were able to express their own viewpoint on some subject or theme related to the play Macbeth. However, they seemed unable or unwilling (or perhaps they thought it unnecessary) to substantiate their viewpoints with facts and evidence from the play. More importantly, the threads of discussion did not lead to any firm outcomes or conclusions. The discussions tended to meander because no leader emerged to help focus the contributions and to summarize each team's case over time.

With the better students on board during the second half of the year, the quality of messages contributed was significantly better. We found that the good students were capable of raising strong arguments in favor of the position they were adopting. Regrettably, we found little evidence of extended discussion, suggesting that students had still not learned to break away from the "individual work" mindset. What was most gratifying, however, was to observe some of the weaker students begin to manifest some evidence of metacognitive awareness. For example, one of the weak students said, "Lady Macbeth is a fiend-like queen (that is what we are trying to prove). Her first appearance in the letter scene . . . [etc.]," manifesting a self-awareness of his goal. Another of the weak students did even better by showing that he could anticipate the opposing team's arguments and stating how he would deal with such arguments.

6. CHANGING THE CULTURE OF LEARNING

Our experience in trying to introduce social constructivist learning through the deployment of MIND BRIDGES shows that getting schools to employ such tools as part of educational practice is difficult. To begin with, we faced practical difficulties. Few schools had computing resources that would adequately support network-based learning with

multimedia. Typical problems faced were that there were too few computers to support the entire class, the computers available were too slow, they did not have sufficient memory, or they had no network card and could not be connected to a network.

Quite apart from resource-related difficulties, the deeper challenge lay in convincing students of the benefits that could potentially be derived through learning in a social constructivist mould, motivating students to make continued use of MIND BRIDGES, and getting students to learn to work collaboratively, rather than individualistically. These desired changes are part of a broader cultural change in attitudes and practices related to learning that are a challenge to achieve.

While some students were highly committed to working on the project, others were barely so. We also found that students need tangible motivators and rewards to encourage them to contribute their best to the project. Sustaining a learning project over an extended period of time can be quite a challenge for 15-year-olds. One of the motivators that we provided was official Certificates of Participation. In our experience, intrinsic motivation alone could not succeed in making the students sustain their project effort.

Our data also suggest that the students had not really learned to work collaboratively, at least, not through the technology. The low number of messages, the high proportion of long messages, and the relative lack of thread messages reveal that students were still more inclined to write long individual expositions rather than short discussion-oriented contributions. The low number of messages may also have been due to other factors. First, access time to the already small number of machines available was limited. Second, the context in which the computers were used was not very appropriate. Students used the computers in the computer laboratory where they sat facing each other. Consequently, they found it more convenient to discuss matters face-to-face rather than through the computer. The technology was designed for distributed learning and in an environment where computers are pervasive (in the classroom, in the laboratory, in the library, at home). But we were faced with a situation where the computers and the students were brought together in the same location.

Related to the above issue, we also found that getting students to engage in directed discussion can be difficult as it requires an important change in their mindset. Our students did not find it easy to move from a “put information into the system” mindset to a “let’s discuss the issues” mindset.

What lessons did we learn concerning teachers? We learned that teacher commitment to the project is paramount. Teachers need to be willing to commit time and effort to participate in the ongoing dialog between students and providing them with modeling and scaffolding support. In practice, this has been difficult to achieve.

We were, however, fortunate that one of the teachers with whom we worked appreciated the importance of good project design. Teachers need to create and instantiate a meaningful context in which the collaborative learning activity can naturally unfold. Left to talk about things over the computer, students will do just that. However, their discussions are likely to be meandering, unfocused, and ultimately unproductive. The design of a competitive context in which the learning took place in our study went a long way in keeping the students engaged in the project.

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7. CONCLUSION

The motivations for social constructivist learning are, we believe, well-founded. Our experience has been that attempting to realize such learning in local schools is quite a formidable challenge. While we have had some success in terms of system development and deployment, trying to bring about a deeper and lasting cultural change in learning practice has proved difficult to achieve. Our goals will require more time, effort, and persistence to be realized. We remain reasonably optimistic, however, that with the greater emphasis placed on the importance of incorporating the use of information technology in education in Singapore schools, the changes we desire to see will a reality in time to come.

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