MacKinnon, G. (2005). Symbolic interactionism: A lens for judging the social constructivist potential of learner-centered chemistry software. *International Journal of Technology in Teaching and Learning*, *1*(2), 89-102.

Symbolic Interactionism: A Lens for Judging the Social Constructivist Potential of Learner-Centered Chemistry Software

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The learning environment of chemistry students immersed in a computer-assisted unit study on acid-base theory was analyzed from a participant-observer perspective. An interpretive framework was used to consider 1) the nature of symbols in this environment and 2) the potential of symbolic interactionism to influence social construction of knowledge. It was found that the integrated interactive technology (IIT) learning model used in this action research–case is supported by the symbolic associations students make with the components of this classroom model. This paper introduces a model for integrating classroom technology/science education research into teacher education studies of learning and technology.

Keywords: Technology Integration, Social Studies, Digital Images

INTRODUCTION

THE IIT MODEL

The integrated, interactive technology (IIT) model is an approach (MacKinnon, 2001; MacKinnon, McFadden, & Forsythe, 2002) that promotes the computer as a curriculum director in the classroom. A relatively small number of computers are used to support a cooperative learning event that spans a typical science unit of 4-8 weeks. Software is specifically designed (*integrated*) based on regional curriculum outcomes. Groups of students address a Science-Technology-Society (STS) unit challenge problem using a quasi problem-based learning approach that involves learning activities at and away from the computer (inherently *interactive*). The multimedia capacity of modern computers allows for a plethora of roles for the computer including: (a) introducing concepts through interactive problem solving using a variety of numerical and textual inputs and feedback schemes, (b) video capture of laboratory techniques for instant access and

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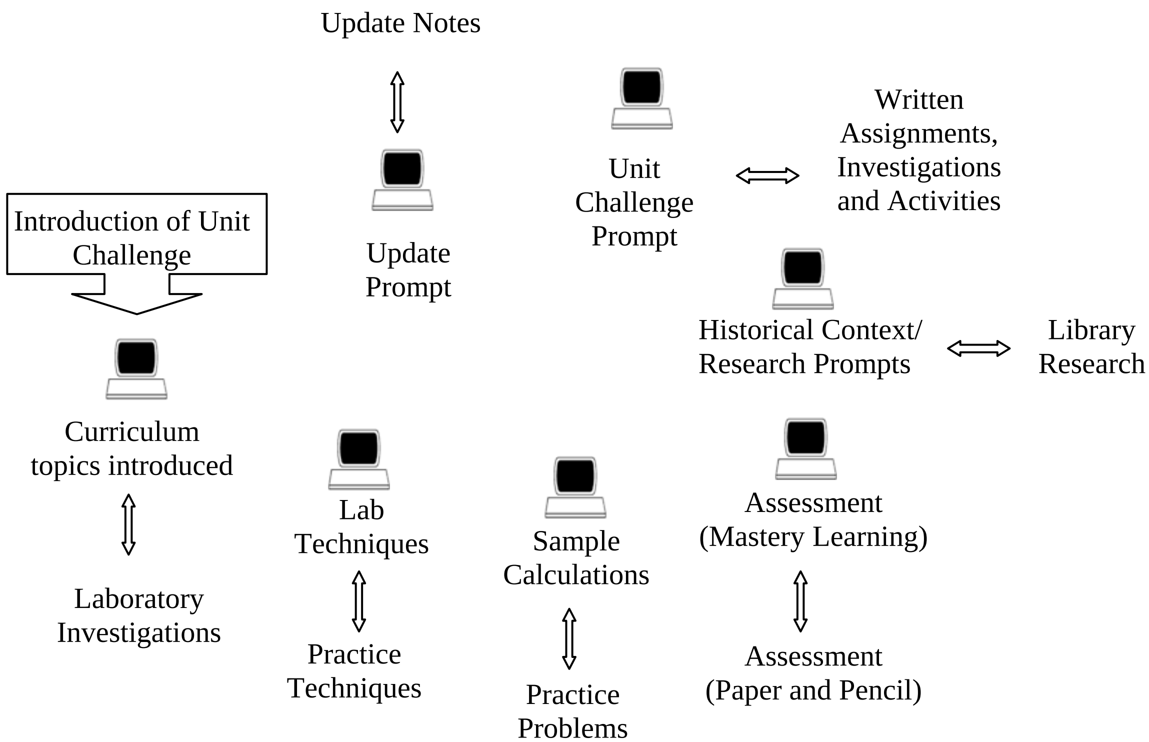
multiple viewings, (c) motivational animations to explain difficult concepts, (d) graphic organizers to scaffold the learning, (e) media-enhanced historical vignettes to contextualize the science, and (f) drill and practice sessions embedded in mastery learning exercises and assessment (Figure 1).

Figure 1. The IIT Learning Model



SYMBOLIC INTERACTIONISM

The theory of Symbolic Interactionism (SI) has received attention (Blumer, 1969; Charon, 1998; Lauer & Handel, 1983; Prawat, 1996; Schwandt, 1994) as a relevant philosophical position and mode of analysis for qualitative classroom observation. Blumer (1969) is considered a key theorist in the development of ideas surrounding SI. There are three core principles to his perspective. First, a principle of "meaning" that contends that people act towards objects (people and things) based upon the meanings that they have given to those objects. Second is the principle of "language". Language provides the tools (symbols) to negotiate meaning. The last principle is that of "thought". The idea here is that we interpret symbols in different ways. In our own minds, we take on the roles of others and try to assume different points of view.

Prawat (1996) emphasises the importance of SI as the social construction of reality: "The process of personal meaning takes a backseat to socially agreed upon ways of carving up reality . . . symbolic interactionism sees meaning as a social product that arises in the process of interaction between people" (p. 220).

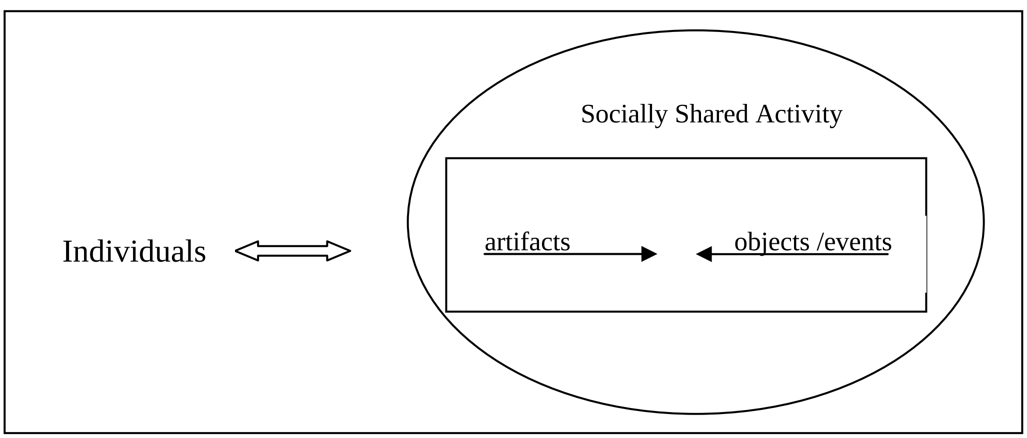
To appreciate the implications of this theory in the context of emerging technologies is to consider the following example provided by Nelson (1998). A girl receives an e-mail message from an old boy friend. In the message, he suggested he was coming to town and was wondering if she wanted to "go out". She excitedly got ready. Much to her chagrin, she met this boy with three of his buddies in tow. He could not understand why she was so angry.

In this situation, the boy and girl had different "meanings" associated with the other. In the case of the boy, it was to be a friendly re-acquaintance whereas the girl sought to rebuild a romantic relationship. With no non-verbal cues, the language "do you want to go out" implied very different things for these individuals. Last, the principle of "thought" comes into play. This girl considered the offer in the context of her feelings, conversed with her friends about the potential for romance and engaged in an internal dialogue that included considering the boy's perspective. In each case, there were symbols that encapsulated entire groups of ideas.

Linking Symbolic Interactionism to Classroom Instruction

There is a considerable amount of general research (Curry; 1993; Darling, 1977; Fine, 1981; Heilman, 1976; Schmidt & Jones, 1991) that builds on the theory of SI. In that these are studies of various social groups, there are obvious links of SI theory to classrooms, particularly through the notion of constructivist learning (Brooks & Brooks, 1993). Constructivists contend that knowledge is personally constructed but socially mediated (Tobin & Tippins, 1993). Constructivist classrooms are social places where actions and reactions to peers and their ideas, particularly in cooperative learning environments (Johnson & Johnson, 1996), are conceivably predicated on the symbols that players hold for objects in that learning environment. It seems clear that it is difficult to embrace the ideology of social constructivism (Taylor, Gilmer & Tobin, 2002) without factoring in SI as a vital component.

Figure 2. Symbolic Interactionism: A Social Constructivist Perspective (adapted from Prawat, 1996, p. 220).



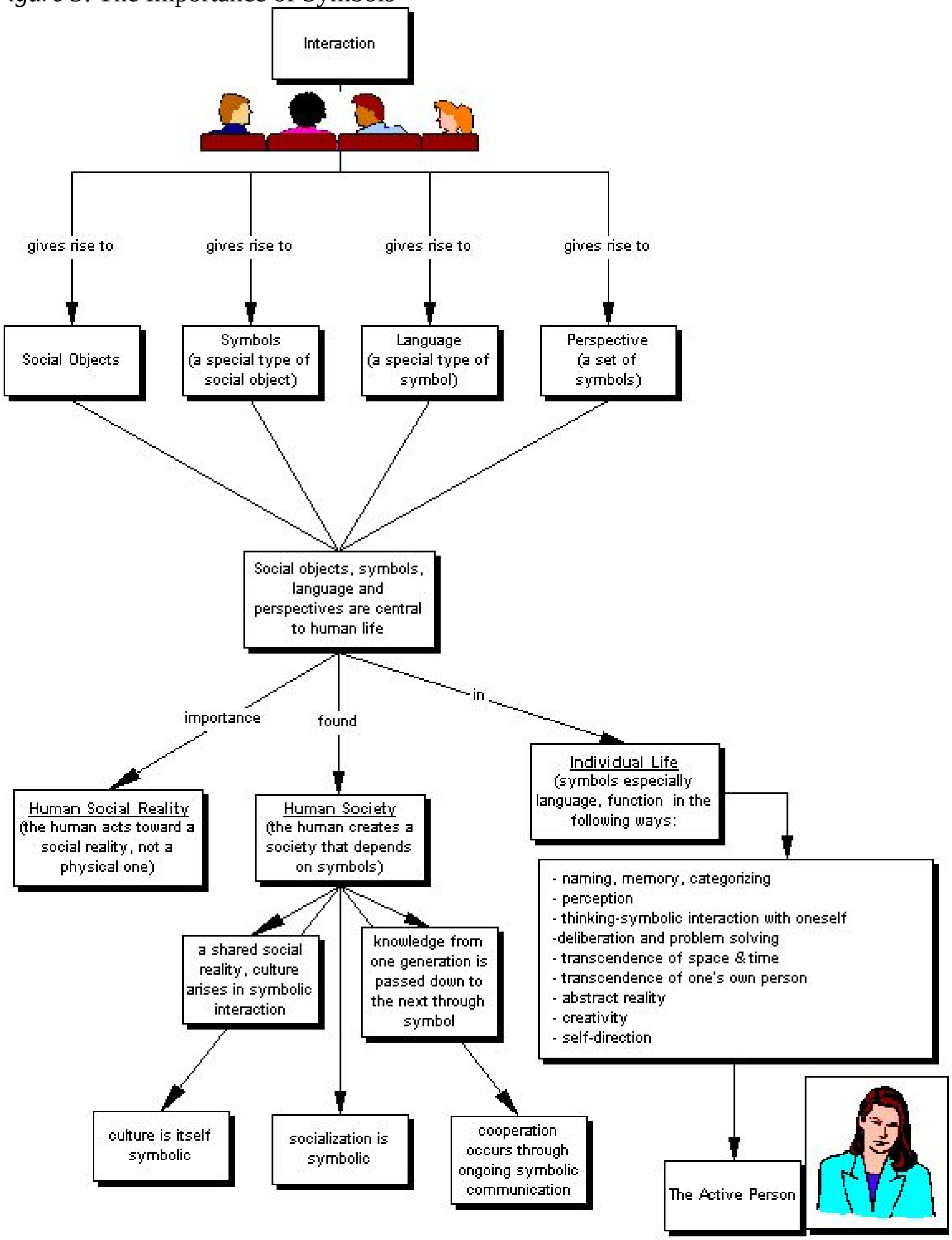
MORE ON THE IMPACT OF SYMBOLS

Consider the oversimplified schematic of SI (Figure 2) showing the interaction of individuals with artefacts, objects and events. In the context of this theory, artefacts are viewed as socially constructed products that become part of the object world to which the individual responds. Blumer best explains when he posits, "a key premise of symbolic interactionism is that meanings assigned to objects in the world arise out of the social interaction one has with one's fellows" (Blumer, 1969, p. 2). Prawat (1996) further elaborates by suggesting:

> …individuals engaged in joint action cannot help but attend to the ways co-participants, especially more knowledgeable co-participants, talk about and interact with objects in the environment. This jointly produced language and action becomes the basis for the taken-for-granted knowledge and practise (Prawat, 1996, p. 220).

Furthermore, symbolic interactionists assume that individual's experiences are mediated by their own interpretations of experiences (Burnett, 1997). Arguably, Charon (1998) gives us the best glimpse of the complexity of symbols (Figure 3).

Figure 3. The Importance of Symbols



In the context of the most recent SI studies around technology use in classrooms (Burnett, 1997; Lu, 1997) it was of interest to me to consider the symbols and social meanings created by students in the IIT model mainly because (a) in our society computers and technology are image-laden and (b) students in this project were working in closely knit social groups. More specifically we are considering learning in a chemistry classroom and as Erickson (1998) so aptly points out, “Learning science is learning a new dialect and, as with acquisition of other aspects of language, learning the dialect of science occurs in face-to-face conversation with others” (p. 1157). This poignantly draws attention to the subtle meanings students may hold for objects in their learning environment. These meanings no doubt influence social construction of knowledge hence the impetus of this research.

METHODS

The IIT model is impacted by the notion that computers hold symbols for students. This is the premise for considering SI as a lens for observing the IIT classroom. The classroom was studied from a naturalistic interpretive philosophical perspective (Erickson, 1998; Guba & Lincoln, 1989, 1994; Neuman, 1989). This stance allows the researcher to negotiate meanings through emergent themes in empirical materials.

SI presupposes that the symbols and meanings held by an individual impacts the nature of their interaction. Specifically in this setting, the researcher was interested in how the students pre-notions (or internalized symbols) of computers and computer learning would impact their social construction of meaning in a computer–directed chemistry unit.

RESEARCH QUESTIONS THAT FRAME THE LARGER STUDY

The study of the ITT model is broad in scope as will be evident in the research questions below. SI is only one lens one might use to examine the entire study.

Fundamental Research Questions

1. What are the characteristics of the IIT learning environment and the community of practice, which constructs it?
2. What is the nature of students’ interaction with computers in an atmosphere where the learning is organised using a computer-based model?
3. What is the role of the teacher in facilitating this model of learning?

Related Sub-Questions

a. What is the nature of students’ interaction with each other as they work co-operatively in this environment?
b. What is the nature of students’ interaction with the teacher in this classroom model?
c. Can computer programs be integrated into chemistry curriculum in a meaningful way?
d. How can the software be modified to better integrate with the curriculum?
e. How can the software and the IIT model be modified to promote an integrated interactive technology?
f. Can the model be forwarded as a constructivist approach to learning science?
g. How do students perceive this mode of instruction?
h. Are students satisfied with the IIT model?
i. What new experiences have students had that go beyond the technology?

j. How does the teacher perceive this mode of instruction?
k. Is the teacher satisfied with the IIT model?
l. What are the observable indicators of student learning outcomes achieved through the implementation of the IIT model?

PARTICIPANTS

The student sample was composed of 60 students in two sections of a grade 12 chemistry class in a rural high school. The sample was not random in that students did not have a choice whether or not to participate as their teacher was directly involved in the study. The distribution of students was 60% female and 40% male. The teacher had participated in the software development and had approximately 7 years of teaching experience. Throughout the study, the author served in a participant-observer capacity taking field notes, conducting interviews and surveys.

PROCEDURES

An 8-week chemistry unit on acids and bases was conducted where students in each of two course sections (in ten cooperative groups of three), advanced through the curriculum with the help of a computer program using a problem-based approach (e.g. acid rain). The natures of the student's interactions in class are outlined in figure 1. In this timeframe the teacher (a) helped students individually, (b) reviewed concepts and mathematical problems with the entire class, and (c) supplied laboratory resources. In this timeframe, the researcher made copious field notes, and recorded audiovisual accounts of student interactions. At the end of the 8-week unit on acid-base theory, students individually participated in three SI survey-type exercises around (a) the principle of meaning, (b) the principle of language and (c) the principle of thought. In each case, the students were given forty minutes to complete the activity. The teacher was also interviewed by the researcher and the entire research data corroborated through a peer-debriefing session with a colleague (this research has been published elsewhere, MacKinnon, 2001).

For each of the exercises an analogous research scheme was followed. The responses from the exercises were tabulated and organized according to the frequency of a coded response. Based on the survey results, standardised open-ended interviews (Patton, 1990) were conducted with five randomly chosen students. Audiotaped interviews were transcribed and coded (Miles & Huberman, 1994) for emergent themes. A peer-debriefing session (to corroborate apparent results) was conducted with a colleague that was not involved in the study. Finally, a member check (focus group session) was undertaken with two independent groups of thirty students to confirm the credibility of the results. To further triangulate the data, the participant teacher was interviewed regarding the output of the SI study component of the IIT project.

THE PRINCIPLE OF MEANING

In the first exercise students (n=60) were asked to write down five words that first came to mind when they were posed a prompting word or phrase. These responses were coded into categories based on similarity of idea expressed by response. Table 1 lists the categorized responses in order of highest frequency to lowest for each prompt.

From the tabulated results it appeared that the only negative "meaning-making" was around two items in the list. The derogatory term "computer geek" rather expectedly drew some negative associations but not as many as were anticipated. This came as a surprise; the positive connotation for these students was a curious feature that warranted further investigation. The term chemistry, for many students elicited a response linked solely to the difficulty of the subject.

Table 1. *Principle of Meaning Exercise Prompts and Range of Responses*

Prompt	Most Frequent Response				Least Frequent
Computer-	Internet	ICQ	mp3	email	games
Group work-	help	friends	fun	discussions	learning
Classroom-	discipline	students	desks	teacher	learning
Teacher-	intelligent	interesting	helper	leader	guide
Computer geek-	intelligent	no social life	unappealing appearance	affluent	male
Chemistry-	hard	fun	laboratories	calculations	important

The other terms, very much associated with the IIT model of classroom instruction, seem to conjure up only positive relational ideas. This reassuring finding nonetheless required additional investigation.

As alluded to above, five students were selected randomly for semi-structured standardized open-ended interviews. The transcribed interviews and member check session helped to clarify the rationale behind the survey results. In the interviews, the researcher probed the students to account for the frequency and relative ordering of responses in the collated survey data. This was followed up by a discussion of their personal perspectives on the symbols that their peers may hold. Lastly, students were asked to suggest what impact their peer's symbolic predisposition might have on their social interactions and learning.

OBSERVATIONS AND INTERPRETATIONS

Given the word computer, this student group predominantly has assigned meaning in two categories namely (a) social communication (e.g., ICQ, chat room, and e-mail) and (b) entertainment (e.g., Winamp, mp3, internet, games). The more formal attributes of computers appear later in the list. In my role as computer instructor even as a little as 5 to 10 years ago I perceived an image that was very different, an image that would have centred around the technology itself; the computer components and the basic computer applications such as word-processing, databases and spreadsheets. At that time the study of the computer was by default in the realm of the "techno-wizards" and not particularly accessible to the public. To probe the associations students currently make, is to recognize that the computer has become an integral part of mainstream adolescent student experience. This comfortable familiarity with the technology seems to make projects such as these far less intimidating to the student. In 60 responses there was not a single even-mildly derogatory meaning associated with the word computer.

Based on the meanings presented, these students appear to look forward to group work situations. They view them first as potentially comfortable social environments and secondly as productive learning environments. It is important to note that upon further probing, students highlighted their concern that group work could be fun but also on occasion socially awkward. From the word associations, I sense that students want to succeed in groups and find it easier to do so with people they know as friends primarily because knowledge of complementary or negotiable work habits is comforting to them.

From interviews and focus groups, classrooms in general seem to evoke images of a barren institutional setting. I purposely choose the phrase "in general" because students view their teacher with high regard. In the context of the exercise, it is highly likely that students in their assigned meanings are influenced by their chemistry teacher. This teacher clearly overcomes the negative image of the physical setting by establishing a nurturing learning setting where students have a great deal of respect for her knowledge, dedication and personable approach. It is difficult to say whether this appreciation in fact extends to other teachers. In the survey, some students seem to harbour at least some negative feelings around the term "teacher" by using word associations such as: mean, loud, boring.

When presented with the vernacular "computer geek", students in interviews and focus groups responded with a curious image. Their words communicate a negative image of a socially introverted male with a decidedly unappealing outward appearance. At the same time, students project an image of a very intelligent and monetarily successful person. This seems to represent a dichotomy that may be restricted to the adolescent struggle for identity. On one hand they may feel a social pressure to present themselves in a fashion that is both appealing and "peer-accepted". (It is interesting to note that the category of geek seems predominantly associated with males.) In opposition to this, student's associate financial success with intelligence and it was clear in some interviews that "computer finesse" was important to students. Student's struggle with the image of a computer-skilled individual was evident in the "posturing" by some students to assume a middle ground with respect to these ideas. Later interviews around language and thought exercises indicate there is a strong cultural change afoot, which attempts to redefine the adolescent that is technologically literate.

THE IMPACT OF PERSONALLY HELD MEANINGS

This first stage of the research allowed for some preliminary conclusions. SI theory is predicated on the idea that students act based on the meanings they hold for objects (people or things), in this case around a learning model. Focus groups allowed students to articulate how the meanings they held may impact their learning. The comments that follow are representative of what students perceived as an impact. In each case, students responded to the prompt "how would the meaning you hold for these objects/things in the IIT model, impact your learning?"

- This way of learning with a real problem to solve, makes us feel positive about chemistry, you know…it's relevant, that makes me more enthusiastic to learn.
- Group work is almost always good, we know that teamwork is an important life skill.
- I don't care what some of my friends might say, inside they know that computer skills are important, we all share that meaning really and so we have a positive attitude about learning in this class.
- I like the interactivity in this class, we all do, it's much better than lectures and so we try harder.
- I think that most of us share a pretty positive view on computers, like everybody's surfin the web and grabbing music and chatting; even though this is using the computer a different way, you know … like for learning, our attitude carries over, we're curious not intimidated like our parents.
- Our teacher really puts out for us, she's always available for extra help and she works really hard, this makes me want to live up to her expectations. I'm not thrilled about my other classes but this one … well its different, not like a regular classroom … I think I will do better.

It seems evident that most students that experienced the IIT model had a positive disposition to the objects in the model. This was corroborated in the interview with the teacher where she remarked, "I am very happy with the way students are working, how much they are accomplishing, and what they are learning. They seem to be enjoying this change … they tell me it's a comfortable way to learn."

THE PRINCIPLE OF LANGUAGE

In terms of the symbols that are shared in a classroom, the principle of language focuses on intended meanings (by the speaker) and perceived meanings (by the receiver). This exercise was chosen to highlight what perceived meanings might be, around terms that fellow students typically used in the classroom conversation. Ultimately, a link between shared language perception and student learning was probed.

Students were asked to imagine that a peer approached them in class and used certain terminologies. In each case, they were surveyed to provide a concise meaning in a paragraph. The terms posed were computer learning, co-operative learning, examinations, laboratories and assignments. The paragraph entries were assimilated in a database and searched for keywords and phrases (Nudist© software). Emergent categories were sorted through a recursive process Erickson (1998) refers to as analytic induction. Results are noted in Table 2. Again, five students were randomly selected and interviewed (as described previously). This was followed up by a focus group meeting and peer debriefing.

Table 2. *Principle of Language Exercise Prompts and Range of Responses*

Prompt	Most Frequent Response				Least Frequent
Computer Learning	fun	interesting	different	skills	programs
Co-op Learning	helping	fun	groups	educational	interactive
Examination	scary	difficult	studying	failing	teacher
Laboratory	chemistry	chemicals	fun	interesting	practical
Assignments	time-consuming	homework	practice	stress	thinking

There was a consensus among students that cooperative learning was an interesting and productive change from the typical lecture format. They saw value in learning to work together whilst sharing goals. When pressed for the origin of their attitudes it became clear that their positive associations were linked to the current IIT experience. This positive disposition was however tempered with a healthy regard for the sometimes-problematic social dynamics of group work.

Positive attitudes towards computer learning as an approach were largely contingent on the current experience, as many students expressed that they had not used the computer to learn before. Students were pointedly asked how peers generally perceive computers and becoming computer skilled. Most students indicated that it was "cool" to be familiar with computers. Others were more forward in suggesting that it really did not matter because computers were a "very necessary" job skill. Still other students were brash in their assertion that they did not care what people thought about their interaction with computers. In reflecting on previous comments, I would submit that some students do care that they are not labelled as computer geeks; however, there is a growing trend for adolescents to define themselves as individuals, a growing reticence to comply with dress codes and socially accepted behaviours. For a small number of students, so continues the tension between personal image and association with computer technology.

The term "laboratories" on the other hand conjured up many more stereotypical images that were in most cases built upon an experience that students had had in an earlier chemistry course. In most instances students saw the practical aspect of practicing chemistry as a significant motivation to enroll in the course.

The language "examinations" and "assignments" elicited a range of meaning-making that spanned mild apprehension to fear. The students while appreciating they needed practice and mastery through assignments, saw examinations as adversarial, something the teacher did to them.

THE IMPACT OF SHARED MEANING THROUGH LANGUAGE

Focus groups were particularly instrumental in directing students to speak about the impact of shared meaning through language on their learning. Student comment in this exercise clarified the tension between a) enjoying the IIT format for learning and b) the desire to do well on assessment items. Rather surprisingly, students were less concerned about whether they were learning! The following are representative quotes from interviews and member checks.

- When I think of cooperative learning, I think of being dependent on group members. Our group worked really efficiently because we relied on each other to do our part. I think we all shared this idea of interdependency and that helped us learn.
- If you ask anyone in this class how they feel when they hear the word examination, they'll tell you it makes them worry…but it also makes them work, we were definitely working better as a group because we shared that sense of urgency to be on-task.
- Assignments are like low pressure compared to exams but I think my friends in the group shared my worries about getting them done. When we think assignments we are also thinking, when is it due! I am sure that makes us work as a team.
- Often labs can be quite long. Labs are fun but we still want to get them done in time…so I guess we kinda are keen to go to the lab but then we have to get organized. You know, we are like responsible to each other to do our part…most often you don't have to tell people that, they just pitch in. I guess we must share the same meaning for lab.
- When I think of this chemistry class; the computers, group work and the assignment and testing stuff, I mostly have good thoughts but I think we all have to admit that in group work we have struggles with who will take the lead. So I think that the phrase cooperative learning may have different meanings for some people, otherwise we would always get things done without hassles.

As participant-observer in this classroom, I could attest to the exceptional on-task behaviors. Discussions with students and the teacher only served to confirm in my mind, that impending assessment was a real driving force for effective cooperative learning. This is disturbing when you consider Hodson's (1998, p. 65) assertion that "many of the practices of science teachers serve to reinforce the bad habits of performance-oriented students and to penalize the more productive strategies of those who are learning-oriented." Nonetheless, in an interview the teacher alluded to power struggles and "effort gradients" in select groups. Students very much appreciated the teacher's flexibility in allowing them to change groups when irreconcilable differences arose. The cooperative learning dynamics then are clearly impacted by a shared understanding of leadership versus teamwork. Gayford (1992) has linked this tension to the motivational levels in groups.

THE PRINCIPLE OF THOUGHT

In this last SI exercise, different types of ideas were chosen for students to respond to. The five ideas presented below (self-discipline, individual accountability, group responsibility, learning and knowledge) tend to be broad concepts that human thought has a tendency to elaborate through life experience. In a survey format, students were asked to explain what these ideas meant to them. Many responses were either lengthy or slightly different in some of their content. For this reason I have recorded here portions of the most frequently used phrases and ideas.

The underlying premise of SI is that we can understand what is going on only if we understand what the students themselves believe about the world (Charon, 1998). In SI, it is important then to study human beings using processual models (a string of developing factors-process) rather than mechanical causal models that emphasise singular variables. This exercise served to elaborate on issues that emerged earlier yet from a different perspective. Responses from this exercise were coded in an iterative fashion to generate the summative framework outlined in Table 3.

Table 3. *Principle of Thought Exercise Responses in Coded Categories*

Coded Category	Specific Response
Self-discipline-	Being able to motivate yourself
	Judging your limits
	Good organisational skills
	A positive attribute
	Resisting a natural inclination to procrastinate
	Putting the best effort forward in a responsible way
	Being able to focus
Individual Accountability-	Responsible for your own work
	Trusting others to do things on their own
	Each person doing their part
	Maintaining a pace or work ethic
	Dependable
	Important for self-image
Group Responsibility-	Each person contributes to the success of the group
	Working well as a group
	Helping each other, teaching each other, sharing your understanding
	Group effort to pass in assignments on time
	Assigning tasks to individuals
Learning-	Gaining knowledge about new things
	Finding new interesting ideas usually with a lot of hard work
	Being able to apply ideas to practical problems
	Asking questions, reading and seeing things from different perspectives
	Growing in your ideas and becoming a better thinker
	Experiencing new ideas
Knowledge-	Things you learn in life
	Knowledge makes you a better person, you have something to share with others
	Very important in order to be productive in life
	Always expanding the capacity of the mind
	Stuff that actually sticks with you
	Attainable through experimenting
	Getting knowledge makes you feel better about yourself

THOUGHT, SYMBOLS AND LEARNING

In all interviews (group and individual) queries of students, it is a difficult task to discern what it is that they believe to be true. This is probably because they are at least some of the time telling you either what you want to hear or perhaps, in the SI framework, what it is that the societal community (their local classroom group included) accepts as the desirable norm.

With this in mind students have given me the impression (based on their thought and experience) that self-discipline, individual accountability, group responsibility, learning and knowledge are all positive concepts. This is born out by their desire to overcome so-called "natural inclinations" such as procrastination. If these norms are then part of student's accepted "taken-for-granted knowledge and practice" how do they impact the IIT classroom? It seems evident at least from the analysis of prior interview data, that many students are willing to work harder to uphold the virtues of responsibility and accountability in group-work efforts. For students who have typically performed poorly in the traditional chemistry classroom this in turn requires a significant improvement in their self-discipline. Some have recognized that personal growth and shared it in the interview sessions. These same people claim that they have learned more and gained lasting knowledge through the application of concepts in higher-order situated problem solving. Finally if the social messages within this classroom are entrenched enough that weaker students are motivated to learn, this model may in fact enjoy some measure of success. This finding is by no means new in that co-operative learning studies have established a comprehensive list of interdependencies. What may be new is the following. The emerging desire by adolescents to be technologically literate, has the potential through groups in the IIT model, to fuel greater social pressures for all individuals to gain universally accepted life skills (e.g., self-discipline, teamwork, lifelong learning).

Students assign meaning and have experiences that define classroom productivity. In group settings, these socially accepted norms have the potential to shape the culture of the classroom.

CONCLUSIONS AND REFLECTIONS

The symbols students hold for artefacts and learning approaches in their classrooms have the potential to impact their attitudes towards learning and their capacity to learn effectively. The qualitative study outlined above provides a glimpse of how students in the IIT learning model are influenced by their perception of the nature of technology and how it has been integrated in this particular setting as a means of constructing understanding. As this is a singular study of one teacher’s implementation of the IIT model, it clearly has limitations. The nature of the students and their socioeconomic backgrounds, the classroom environment, the curriculum and the teacher’s approaches are but a few factors that may impact or limit this study. It remains for the reader to draw similarities to their own settings. The success of the IIT model relies heavily on significant student interaction and therefore students' preconceptions of technology are of great importance. Clearly a setting and teaching approach that elicits negative symbols and feelings amongst the participants, is less likely to be bring about positive learning outcomes.

This study establishes that the symbols that students hold for the IIT model are largely positive and that technology in general is not a deterrent to their learning but moreover seems to be perceived as a progressive tool as used in this model. Qualitative data has focussed and confirmed the importance that students place on the nature of technology use. Students were very quick to note that their positive symbols for technology were precariously rooted in a sensitivity to "appropriate and productive" use of computers in their learning.

The research in itself has encouraged these students to reflect on their thinking patterns (metacognition) and to articulate the blend between their personal and social construction of knowledge. This has helped individuals define more clearly their own preferred learning styles and the role and extent that technology might have in their preferred modes. The research exercises have shown that students can gather valuable information about the power that their perceptions may have over their own learning; particularly learning in social settings such as the IIT model.

Qualitative studies such as this are important because they access information about classroom learning dynamics as affected by popular culture (i.e. perceived symbols). The research on the IIT learning model demonstrates that this classroom culture accepts technology as a viable tool for learning.

I offer a word of caution for those considering an SI framework. Mead (1934) in his analysis of human conduct notes that people have the ability to view their own behaviour from the standpoint of another. They can imagine what their actions will be taken to mean by others and therefore are able to organize what they do, while they are doing it, so as to adjust to the anticipated responses of others. At the onset of my consideration of the usefulness of SI in this study, I asked students two questions:

1. When you work with others at the computer, do you feel like you have to pretend that you know more about computers?
2. How do you think the co-operative effort will dictate your behaviour?

In their responses, students could hardly hide the fact that they were incensed that I would imply that they would play "roles". They insisted in both instances that they would certainly not act any differently than themselves. Blumer (1969) would subscribe that this role-taking is in fact part of the socially-manicured self that all humans embrace, whether we will admit it or not. To focus this discussion I pose a dilemma that undermines all interview-based research. Do interviewees tell you what you want to hear or can you create a trust that allows the researcher to get past the socially constructed symbols and analyse the true feelings of participants?

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