CONSTRUCTIVIST LEARNING VERSES EXPLICIT TEACHING: A PERSONAL DISCOVERY OF BALANCE

A Synthesis Project Presented

by

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ABSTRACT

CONSTRUCTIVIST LEARNING VERSES EXPLICIT TEACHING:
A PERSONAL DISCOVERY OF BALANCE

May 2009

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This synthesis reflects my exploration of the theories of constructivist learning, explicit teaching, and social learning in the context of my work as instructor at Children's Technology Workshop- a company that runs creative technology programs for children. I provide a description of each theory with examples based on my experience at CTWorkshop and claim that while constructivist learning and explicit teaching do have some noticeable differences, they share the common element of social learning opportunities. Additionally, I argue that constructivist learning and explicit teaching are not necessarily incompatible approaches to education, but can be effectively combined to minimize the deficits and utilize the strengths of each, and such a combined approach to instruction can enhance the social learning opportunities available in the educational environment of CTWorkshop's icamp program.

Since this paper is reflective of my own, personal experiences working in a particular educational environment, I do not except that the specific uses of these theories described in this paper will necessarily pertain to the educational settings in which others may work; however, my intent is not to design a plan for others to use in their own instruction, but rather inspire others by

my example to think more deeply about their own methods of instruction. As my reflective conclusion explains, the process of working on this project has affected me deeply, and I hope this paper may motivate others to seek their own insights.

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INTRODUCTION

Until recently, my familiarity with teaching and learning was limited to my own personal experiences sitting in a classroom. In middle school and high school, I remember sitting at a desk while teachers talked; I remember taking notes and trying to memorize them before tests; I remember taking home worksheets and filling in the blanks; I remember doing science labs and following specific steps to make an experiment work. And now that I have my high school diploma, I hardly remember anything I was supposed to have learned in those classes: I never identified with the information because it seemed to have no use for me outside of getting grades, which in those days was not something I was very interested in anyway. I did have more success with learning as an undergraduate student in college: now I attribute that success to my interest in the material more than how that material was taught, but at the time I never really thought about it.

Not until last summer when I started working at Children's Technology Workshop in their icamp program did I start thinking about how people teach and how people learn. While working at camp, I became fascinated by the different ways that information and knowledge was being exchanged between all people present; instead of only trickling down the hierarchy from the camp director to instructors to the campers, knowledge flowed in multiple directions, with people in each tier learning from others not only about technology tools, but also about how to work better with each other. Watching an exchange between another camp counselor and an overtired and cranky camper, for example, helped me learn potential responses I could use in a similar type of situation. That summer at icamp was also the first time I worked with children in the 7-12 age range and the first time I had children that age looking to me as a model. What I was modeling, whether a thinking strategy, interpersonal communication style,

or behavioral disposition, could vary, as could a child's recognition of that modeling. But the potential was always there that some young mind could be looking to me for some kind of information or guidance. This recognition inspired me to learn more about theories of teaching and learning so that I could conduct my interactions with young people with a more informed awareness.

This synthesis reflects my efforts to develop a better understanding of how learning and teaching occur specifically in my work at Children's Technology Workshop by examining and comparing the theories of constructivist learning and explicit teaching, and also by exploring how both theories work with concepts of social learning theory. I wanted to learn about constructivist learning because this teaching theory has been cited by CTWorkshop as the pedagogy underlying all of the company's programs. As I read about constructivist learning, I noticed that much of the literature I reviewed contrasted constructivist learning theory with the theory of explicit teaching. However, when I looked further into this second theory, I realized that elements of explicit teaching are also present in CTWorkshop programs, and that the two theories do not need to be mutually exclusive. I also came to see that while these two theories have many differences, they also have many similarities, the chief of which is their use of social learning. Analyzing the strengths, weaknesses, similarities and differences between constructivist learning and explicit teaching has helped me come to better understand my role as an instructor in CTWorkshop programs and my general capacity for teaching.

The words "teacher", "student", and "learning" are often associated with the classroom, which is unfortunate, because learning and teaching can happen anywhere. To emphasize this point in this paper, I have decided to use the term "instructor" instead of "teacher", and "learner" instead of "student". These terms are not perfect either-- instructors can also be

learners while they teach-- but use of these terms may help remind us that teaching does not need to happen just in front of a chalkboard or learning from behind a desk. For similar reasons, I have used the term "learning" very broadly in my descriptions of the theories presented, because while much of the learning that happens in educational environments is related to specific subject matter and procedures, learning can also be related to self-reflection and interpersonal relationships.

This paper attempts to break apart constructivist learning and explicit teaching in order to look beyond the word symbols of both terms and examine the ideas on which they are built. Chapters one and two describe the components of each theory and the strengths and limitations of each. It is important to note that, reflective of their pedagogical differences, these theories are described in different terms: Constructivism is comprised of non-linear principles that guide lesson plans, whereas explicit teaching involves a sequential series of steps which instructors work through to teach a specific lesson; for this reason, the structure of their discussion in this paper is not entirely parallel. While these differences should be kept in mind, they should not impede our ability in chapter four to discuss the similarities and relevance of both theories. Since I argue in chapter four that social learning is a common component of both theories, chapter three examines the theory of social learning to better understand this component.

I hope that this paper will help others that work in educational environments-- whether formal classrooms, after-school programs, one-on-one tutor sessions, or others-- to become more aware of their own teaching methods. A 2007 survey of 600 American K-12 grade teachers found that many have little or no understanding of different principles of teaching and learning; most teachers reported that they base their teaching decisions "on intuition and

experience" (Roehl & Snider, 2007). While experience and flexibility are valuable resources for any instructor, educators must also consider *why* they teach the way they teach if they are to improve their practice. By becoming familiar with different theories of teaching and learning, educators can not only gain insight into their own existing practices, but also may find useful alternatives and new ideas that can enhance their teaching.

While the examples used in this paper are reflective of my own experience with teaching and learning in CTWorkshop programs and are not designed to be universally applicable to all other learning situations or environments, this distinction does not mean that my examples cannot be useful to those working in other teaching environments, such as a formal school classrooms or one-on-one tutoring. Rather, I would hope that others can learn from the concepts on which these examples are founded and apply those ideas to their own situations.

The following chapters discuss the theories of constructivist learning, explicit teaching, and social learning. But since these discussions are framed in the context of my work at CTWorkshop, it will be helpful for you to read the following description of CTWorkshop and know a little more about the company.

CTWorkshop and icamp

Founded in 1997 by a former science teacher frustrated by his school's inability to keep up with new technology and their creative potentials, CTWorkshop is a company with branches across the world that teach children in grades 2-8 how to use technology tools for creative purposes. Programs include after-school workshops that focus on a particular technology stream, such as robotics or game-making, in-class programs that focus on principles of engineering and science, such as simple machines or motion, and the icamp, or

individualized learning camp program. Unlike other CTWorshop programs which focus on one particular technology stream, at icamp children experiment with many different forms of technology to create their own story-based project. On the first day of camp, each camper picks one of eleven story themes, such as Mission to Mars, Expedition Egypt, or Fashion Designer, and makes a story about that theme. Campers then spend the rest of the week using different technology applications, such as graphic design and digital video production, to bring their story to life. For example, a camper might pick the Medieval theme and make a story about a cowardly dragon that is afraid of the knight that comes to slay him, but the knight feels sympathy for the dragon, and they become friends. They convince the town's people that the dragon is not dangerous, and at the end of the story the dragon goes to live with the knight in his castle. To bring this story to life through technology tools, the camper might build a LEGO dragon, design paper characters and scenery to film a movie, and make a video game in which the knight goes to the forest to get the dragon and bring him back to town. In the process of making such a project, the camper is using her imagination to invent original ideas while also becoming more familiar with how to use computers, webcams, and different software tools.

When I started working at icamp, I was excited by the prospect of helping children develop their creativity, but I was even more intrigued by the descriptions on CTWorshop's website explaining their teaching philosophy, though those descriptions have since been removed from the company website. CTWorkshop programs were described as "employ(ing) facilitated play as a means to let children learn through exploration, invention and creativity, doing projects, working at their own pace and level," and cited constructivist learning as the founding pedagogy underlying all CTWorkshop curriculum, software, and programs (Children's Technology Workshop, 2008). An entire webpage was dedicated to explaining

CTWorkshop's understanding of constructivist learning, describing a constructivist learning environment as one in which "technology is used to keep children actively engaged, constructive, intentional, complex, contextual, collaborative, conversational, and reflective" (Children's Technology Workshop, 2008). In another time and place, these words may have had little meaning for me, but at the time I received this job I had just completed my first year in the Critical and Creative Thinking Master's program at the University of Massachusetts Boston and had been learning about many of these very concepts. As such, I was thrilled at the opportunity to put my newly acquired theoretical knowledge to practical use.

With that understanding of CTWorkshop and my personal interest in working for the company, let us now examine constructivist learning theory more thoroughly.

Chapter 1

CONSTRUCTIVIST LEARNING AND ASSOCIATED PRINCIPLES

As mentioned, the teaching philosophies of CTWorkshop are based on principles of constructivist learning. CTWorkshop's website originally included several pages explaining the company's understanding of constructivism and the "attributes" of constructivist learning environments. As used in the creative technology company, a constructivist learning environment is one in which "technology is used to keep children actively engaged, constructive, intentional, complex, contextual, collaborative, conversational, and reflective" (Children's Technology Workshop, 2008). This chapter explores those concepts which CTWorkshop associates with constructivist learning in order to distinguish what makes this type learning different from explicit teaching- a theory in which information is taught directly and explicitly by an instructor.

What is Constructivist Learning?

Constructivist learning is a student-driven process in which learners develop, or construct, their understanding of information as they work with concepts and think about their processes. Instead of receiving information from a sole authoritative source of knowledge considered to have the "right" answers, students incorporate their own outside experiences and perspectives as well as those of other students to develop their own understanding of concepts (Glenda, 1996). As a learner-driven theory that emphasizes exposure to multiple perspectives, constructivism assumes that each individual sorts input from the external world through the filter of his or her own experiences, and therefore each individual will have a slightly different relationship with and understanding of external input and new information (Duffy & Jonassen, 1992).

While instructor-driven theories assume that learning happens as learners *receive* information from the external world, student-driven theories assume that learning happens as learners *integrate* information from the external world with their preexisting schemas of knowledge to develop their own understanding of meaning (Collay, Gagnon & Schmuck, 2006). Rather than giving the control of learning to the instructor by providing controlled lesson plans, constructivism gives control of learning to the learners by allowing their curiosity and need lead instruction and by providing flexible time for learners to experiment, think, and reflect about what they are doing and learning (Grennon-Brooks & Brooks, 1999). This flexibility does not mean that constructivist learning is a student free-for-all in which the instructor has no role or purpose; instead, constructivism asks that we reconsider the role of the teacher from one of controlling authority to one of guided mediation; the instructor guides the learning process by asking questions, making suggestions, and explaining concepts instead of trying to explicitly transfer correct information to the learner. Although learners in a constructivist framework are responsible for developing their own understanding and meaning of knowledge, the instructor is responsible for providing opportunities and resources to facilitate that learning, and for guiding learners by means of questioning and mediation.

In an engineering workshop, for example, an instructor might talk with a class about general bridge design and show examples while asking questions that draw responses from the children. After this brief overview, children would be given the materials needed to construct a model bridge that can support a given weight. As the children's bridges fall or support the weight, opportunities are created for the instructor to further discuss more specific concepts involved in bridge design, such as force, symmetry and triangulation. In this type of learning environment, the children learn new concepts by using those new concepts for a practical

purpose, and through such use they can apply their own experiences to their understanding of the combined information; this first-hand work with new concepts allow learners to internalize information so that they can work with and retain that knowledge (Young, 1995).

With this general understanding of constructivist learning theory, we now examine the qualities characteristic of constructivist learning environments as described by CTWorkshop: active engagement, constructive, intentional, complex, contextual, collaborative, conversational, and reflective.

Active Engagement

A key principle of constructivist learning is that learners actually work with and use new concepts instead of receiving information from the instructor and repeating that information back. While learning *about* things can be informative, it does not prepare students to *use* and *do* things (Johnson, Johnson, Sheppard & Smith, 2005). By physically and mentally manipulating materials and ideas, students participate in a process that creates experiences they can think about and reflect on, and through such participation and reflections they can develop a relationship with the information and concepts involved. Lengthy and detailed lessons from the instructor do not precede these activities; rather, the instructor designs learning activities that provide opportunities for experimentation and discovery, and guides the learning process through questions and feedback (Johnson et al., 2005).

As described on the CTWorkshop website (2008), children do not discuss physics and game theory before they start playing baseball; they go over the general rules of the game, get on the field and start playing. As the game unfolds and various situations arise, they discuss ideas together and develop new understandings of how to play through formal interactions like calling a time-out, and informal interactions like talking across the field, but they learn through

the active process of engaging in the activity. Similarly, if a camper is learning to film a stop-motion animation, an instructor does not first describe details of all the processes involved in making the movie. While a child may eventually need to know the exact process by which to narrate her animation, this information does not need to be detailed before she has even started to film. Instead, the instructor goes over the general principles and tools used to make a stop-motion movie, gives the camper a camera and computer, explains how to use the camera and software, and then lets the student experiment with the equipment. As the child works, the instructor mediates the learning process by asking questions, making suggestions, and explaining additional concepts and tools, and the learning is driven by the camper's needs and interests. By actively engaging in the process of making a movie, the camper develops her own working understanding of how to make a stop-motion animation using webcams and computers by actually trying to do it.

Construct

The common simile that teacher-driven teaching theories approach learning as if a learner's mind is "an empty vessel" ready to be filled by an instructor implies that learners come into a learning environment without previous knowledge or experience. While we know intellectually that learners are not completely empty vessels, learning environments often do not take an individual's previous experience into consideration when relaying information or designing learning activities; such environments typically dispense information to all students through one approach without accounting for differences in learning styles and personal experiences. In contrast, constructivist learning environments utilize the individual differences of learners to create foundations on which each individual can build new, meaningful, knowledge. When new information can be integrated with existing and familiar information,

learners can build their own, personally meaningful, understanding of that new information (Collay et al., 2006). As learners are supported in experience and reflection, their evolving knowledge becomes more complex (Children's Technology Workshop, 2008), and they can develop more inclusive and more complex mental relationships between concepts (Grennon-Brooks, 2005).

CTWorkshop programs use Legos to make robots and machines, and while most children come to icamp with some experience building with Lego, few have experience in using these materials to build intricate and moving creations. Many campers have not worked with the additional Lego pieces, such as gears, axles and friction pegs, that are needed to make working machines. All such campers working on robotic projects need to expand on their existing knowledge of Lego construction to develop more complex knowledge of how to build with Lego materials; however, not all campers will expand on their existing knowledge in the same way. Each individual camper has a different history of experiences with other foundations of knowledge-- such as mechanics, engineering, or programming-- that make up the existing associations of meaning which he or she must expand on to develop new knowledge; these different histories affect how each child will construct new associations, and also affect the type of mediated support an instructor will provide. A child who is building her first robotics project but has experience making video games, for example, already has existing knowledge about programming that she can refer to when as she learns to build and program a robot. Although the specific types of programming involved in these two projects are different, the basic logic of how they operate is similar, and an instructor helping the child learn to program her robot can liken aspects of the new programming technique to those of the previous process to help the camper expand on her existing body of knowledge with new information.

Intentionality

As the CTWorkshop website (2008) stated, "all human behavior is goal-directed. These goals can be simple like satisfying hunger or complex like developing new job skills," but there is some goal being strived for. One type of educational goal is learning-based, in which the process of learning is the goal (Grabinger, 2001). With learning-based goals, learners are asked to focus their attention on their thinking processes and on their understanding concepts. As learners focus on the content of new information and their understanding of that information, they are able to identify and ask questions that can improve their understanding of the information, an ability that demonstrates their awareness of what they do not understand or know and therefore shows an increased understanding of their own thinking, or metacognition. Learning environments designed with specific learning goals help learners understand why the information they are working with is important and relevant (Grabinger, 2001). Goals can also be performance-based, in which the learner seeks public recognition for a produced product. Although exclusive focus on performance goals can cause anxiety and stress for learners and inhibit their ability to retain knowledge after task completion, limited performance goals can be helpful in building confidence in learners because they can see productive outcomes and accomplishments result from their learning (Grabowski & Song, 2006).

CTWorkshop learning environments utilize both learning and performance oriented goals. In learning to make a video game at icamp, campers work with a series of tutorials that each focus on learning goals for understanding specific concepts of game-making, and campers use those specific concepts to make each element of a playable game; these goals are noted at the beginning and end of each tutorial to reinforce the lessons. As campers work through the tutorials and work with more complicated concepts of programming, they are expected to build

on their knowledge of concepts from earlier tutorials to complete more complicated tasks. Instructors working with these campers support learning goals by stressing the importance of taking time to understand each tutorial and not rushing through the process, because campers will be expected to use concepts presented earlier in the process again later as they make their games. While instructors will work with campers to further explain information presented in gaming tutorials and will remind campers how to accomplish an element of game design, instructors will not repeatedly re-teach elements of game making; if a child needs constant reminders on how to accomplish an element of game-making, then most likely he is not paying attention when he is being directed through the process of completing the task, and needs to go back to re-learn that step.

Performance-based goals at icamp involve the campers' final projects. All children at icamp make a mini-movie about their project, and on the last day of camp, friends and family of the campers come to watch each child's movie played on a big screen. The camp director says a little about what each camper achieved during the week and gives each one a certificate of achievement and a CD copy of all the project movies. Campers are aware of this event when they first come to camp, and in addition to recognizing the time and effort campers put into their work, the performance goal serves two other important functions: For campers who want to rush through their project and not take time with details, the performance goal encourages them to slow down and think about how they want other people to see their project and experience their work; for campers who overcome personal barriers while working on their project, the presentation and performance reaffirms their confidence and self-efficacy in their ability to accomplish challenging tasks. In both cases, the performance goal encourages

learners to take pride in their work; however, it should be recognized that performance goals at icamp are always used to complement and enforce learning-process goals.

Complexity

There are many reasons why adults oversimplify or simply do not explain some subjects when talking to curious children that ask about everything from where babies come and why the is sky blue to why there is war and what happens when people die. The child's age, our own knowledge, social circumstances, and time considerations all can factor into our response to such inquiries. While these issues maybe relevant in some situations, children do need to be exposed to and engaged in such complicated discussions in order to develop higher-order thinking skills; just as physical growth is enhanced by the challenges of physical exercise, cognitive growth is enhanced by the challenge of complex thinking. When adults consistently oversimplify problems and concepts for children, we reinforce the development of oversimplified world views and do not prepare children for the complexities of real-life problems (Children's Technology Workshop, 2008). That is not to imply that adults should talk about complex ideas with children in the same way they talk about those ideas with other adults; rather, adults must strike a balance between a child's existing cognitive development and the thinking that a child is capable of when assisted by a more informed person who has more information. Vygotsky described this difference between what a person is capable of when performing tasks on their own and what a person is capable of when guided by a more knowledgeable person as the zone of proximal development (Vygotsky, 1978). As further discussed in chapter three, exposing a child to ideas and tasks that are more complicated than those that the child is already familiar with helps that child develop more elaborate cognitive processes (Wertsch, 1988). As children understand complex ideas and meet complicated

challenges, they build confidence in their ability to perform such tasks and are better prepared to later build more complex structures of knowledge (Collay et al., 2006).

At icamp, children ages 7-13 work on individual projects in a shared space, and the work space is organized so that those working on similar types of projects are situated near each other, allowing them to easily share ideas and learn from each other. Campers of different ages that are working on robotics might start with the same basic concept for their robots, such as to build and program a roverbot that can navigate across a terrain, but it is not uncommon for older campers to take it upon themselves to modify the original robot designs and enhance the construction or program, such as by changing gear ratios to make the rover stronger or move faster. These modifications pique the interest of younger and less experienced campers, who then want to enhance their own robots and are thereby inspired to take on more complex challenges. As the younger campers work to enhance their own projects and successfully execute more difficult challenges, they develop pride and accomplishment in their abilities, thus building their confidence in their ability to complete complicated tasks. This principle of complexity does not mean that younger children should be pushed to compete at the same level as older children; icamp instructors are careful to monitor the additional challenges younger campers attempt to make so as ensure those goals are within the reasonable abilities of each individual learner.

Context

Just as “talking down” to children to oversimplify complex concepts inhibits their ability to develop more complex cognitive processes, learning environments that present information in obscure contexts that children cannot relate to inhibits their ability to transfer that new information to practical applications (Brown et al., 1989). Citing research done by

psychology professors George A. Miller and Gildea, Brown et al. describe how people can learn language quite rapidly when their learning is situated in ordinary communication, but when language is learned by memorizing definitions outside of a natural context that contains supporting sentence structure and use, the learner does not acquire a practical and working understanding of words. A child trying to explain how his teacher encourages children to learn would not quite convey that message if he wrote "The teacher stimulated her students in the classroom," despite a dictionary definition describing "stimulate" as "to cause interest". Similarly, the meaning of ideas and information evolve as those ideas are used in contextualized situations. Such authentic learning contexts teach learners to identify appropriate uses for information and concepts (Grabinger, 2001) and are also more meaningful to learners because, since they can relate what they learn to everyday experiences, they can see how what they are learning can be useful outside of the classroom.

File management is a simple example of contextual learning in icamp. All campers create a number of computer files during the camp week, and being able to locate these files when needed is crucial for finding the right footage and piecing together a camper's final movie, tracking project changes, and generally keeping campers and staff from worrying about locating files. Campers making animations can film each scene as separate file and even film multiple takes of several scenes, but they have limited time for the length of their final movie and cannot show everything they filmed in that time limit; campers need to keep their movie files organized on the computer so that they can find the scenes they want to include in their movie and avoid re-taping already filmed scenes which cannot be found. While instructors do go over the importance of being organized and give suggestions on how campers can label and arrange files in computer folders, it is not until the children have their own files to work with

that the importance of this lesson is put into a natural context which shows the value of this lesson. When the campers need to find their own work to make and track their own projects, the value of having a system of organization becomes their own because it is useful to attaining their own personal goals.

Collaboration

Just as constructivist learning theory asks that we reconsider the idea of the instructor as the only authority of knowledge, it also asks us to reconsider learning as a solitary act. Although people certainly can learn from their own solitary experiences, social interactions can expand our thinking and expose us to new ideas--- a concept explored in more detail in chapter three. In collaborative learning environments, individuals must balance their dependency on others with their own accountability to the group in order to reach shared objectives (Johnson et al., 2005). As individuals work to communicate, resolve disagreements, and achieve goals, they are forced to examine their own thinking, behaviors, and relationships with others, which creates opportunities to modify their own thinking, behaviors, and relationships (Costa, 2000). Collaboration also can develop individuals' self-esteem because they are needed for the group. When group members share responsibly and support one another, individuals within that group can develop an emotional sense of self-worth and usefulness because they are needed to advance the shared group goal (Biehler & Snowman, 2003). The successful completion of a joint effort also brings individuals within that collaboration closer together through the shared achievement of reaching the mutual goal.

Each child at icamp spends the camp week working on his or her own, individual project, but the last day of camp is spent making a group project. Usually this project involves making a group movie with campers fulfilling the roles of actors, story writers, directors,

editors, and so on. The project is an explicit learning opportunity for instructors to talk with campers about what it means to work as a group, to balance one's individual needs and desires with those of others, and the importance of respecting each other despite disagreements. An instructor will work with the group and help campers with the project but will not do the project for them; the children are responsible for working together to make the final movie happen. The process often has a shaky beginning as children encounter conflicting or just different personalities and ideas, but as the day progresses, and with instructor assistance, individuals within the group learn to negotiate their differences in order to reach the common goal.

Conversation

Similar to collaborative learning, conversational learning helps learners develop and expand their concepts of knowledge and information by exposing them to new information and alternatives--- as discussed above and elaborated in chapter three. In addition to exposing learners to new information and alternative perspectives, the exchange of ideas and personal sharing that occurs in conversation can also help people recognize their similarities, develop bonds, and learn from one another as models of behavior and thinking; as people talk and share their thoughts with one another, a trust and understanding can be built that can open those involved to new perspectives (Baker, Kolb & Jensen, 2002). Additionally, when people articulate their ideas and explain their thinking to others, they think through their reasoning and re-examine their ideas, as emphasized in the section below on reflection (Biehler & Snowman, 2003).

Children come to icamp with different levels of experience using technology, and they work on individual projects in a shared space which is organized so that those working on

similar types of projects are seated near each other so they can see how other children are making their projects, ask questions, help each other and share ideas. A girl trying to make a stop-motion animation using clay characters might have trouble making clay figures that can stand on their own and be manipulated for each shot, but if she asks another camper making a movie with clay characters how he made his figures stand up, she can initiate a conversation on the different techniques campers use to make movies, and she creates an opportunity for dialogue. As the boy explains the way he designed his characters, the girl can ask questions and make other suggestions, and the two campers can share their own experiences and ideas. Such conversations benefit all involved as participants articulate and explain their thinking, share their knowledge with others and are also themselves exposed to new ideas. Additionally, such conversations create relationships among campers as they realize similar interests and build friendships.

Reflection

Conversation provides opportunities for learners to reflect on their thinking and analyze the process they used to reach opinions and ideas; as individuals attempt to explain their ideas to someone else, answer questions and respond to feedback, they think through their reasoning and re-examine their ideas (Biehler & Snowman, 2003). Such re-evaluation may help people reaffirm their ideas to their own mind or may cause them to reconsider some of their positions, but in either case reflection allows learners to follow their own thought processes (Lochhead, 2000). As people learn to follow their thought processes, they learn to recognize inadequacies in their understanding of information and can thereby ask questions and seek information to gain clarity. Such thinking about thinking, or metacognition, teaches learners that thoughts do not just magically happen, but that thoughts can be directed and guided by the thinker (Swartz,

2000). Reflection also helps learners build knowledge constructs, because as they reflect on their thinking and thinking processes, they relate their own personal experiences and associations to the information and make that knowledge their own (Martin, 2002). This personal identification and the act of reflecting on thinking helps the learner retain information and increases his ability to transfer that knowledge to other contexts (Johnson & Johnson, 2000).

Instructors at icamp encourage reflection with campers and each other both explicitly and implicitly. An instructor will specifically talk to campers about taking time to step back from their work to think about how they are doing certain steps, and will also talk about how to handle feelings of frustration and anger when working on a project. As campers work on their projects, instructors ask the children questions about what they are doing, which encourages campers to think more deeply about their own ideas and why aspects of their project might or might not be working. When a camper has trouble making a particular element of his project function, an instructor does not simply fix the problem but goes back through the steps with the camper, and that process in itself usually causes the child to recognize what he missed or needs to correct. Bringing children's attention to their own thinking and working process not only helps them discover their own errors and their own innovations, but also initiates the habit of thinking about their thinking to avoid repeated errors in the future.

Criticisms of Constructivist Learning

Constructivist learning may provide opportunities for learners to create their own, unique relationships with and understandings of new information, but the theory does present some difficult challenges, many of which concern the notion that learners construct their own understanding of external information. If learners are responsible for constructing their own

knowledge, how can instructors ensure that the constructed knowledge learners develop is accurate (Olson, 2003)? If the direction of the learning process is determined by the interest and needs of the learner and the instructor does not explicitly provide specific facts and information, how can learners judge the accuracy of their own understandings (Olson, 2003)? While some theorists do take a hard-line approach to constructivism and allow learners to "arrive at self-chosen" positions with little or no objective information given by the instructor (Duffy & Jonassen, 1992), the descriptions and examples presented in this chapter describe a more moderate approach to constructivist learning, encouraging instructor mediation that limits concerns for learners developing inaccurate understandings of new information. As this chapter has explained, although instructors in a constructivist learning environment do not provide lengthy lessons and do encourage students to figure things out for themselves, instructors are also expected to guide learners' experiences by asking questions, having learners explain their processes, and having learners demonstrate use of their new knowledge through active engagement in authentic projects and activities. Such instructor mediation largely displaces concerns for the accuracy of learners' understanding of new information.

Because constructivist learning is learner-driven instead of instructor-driven, it can be difficult for instructors to negotiate the balance of their role as a mediator; often instructors think they are using constructivist practices, but are actually missing important elements of the process. When supervising a hands-on activity, for example, the instructor may stop the activity when learners make a mistake instead of allowing learners to make mistakes and learn from those missteps (Grennon-Brooks, 2005). Conversely, instructors may provide too little guidance in the learning process, giving learners total freedom in the learning environment. Although constructivist learning does require that students have enough freedom to explore

and discover knowledge, without any guidance learners might not understand new information and therefore be unable to integrate the new material into their existing knowledge (Mayer, 2004). For constructivist learning to be effective, instructors must guide learners to information and understandings that are relevant and accurate to the task at hand (Duffy & Jonassen, 1992).

Learner-driven theories such as constructivism demand the time and energy of instructors, many who have very limited resources of time and materials and that are not trained in how to facilitate constructivist learning environments. Constructivism also places a great deal of the responsibility for learning on the shoulders of the learners, who may not be used to having so much freedom and control over their own experiences (Duffy & Jonassen, 1992). These concerns are not very relevant to CTWorkshop; the expectation of what learners will achieve working on a robotics project at icamp is very different than the expectation of what learners will achieve working on a science lab in a sixth-grade classroom. By nature of the programs, instructors at CTWorkshop are equipped with the material resources they need, and while there are time limitations, instructors have a great deal of flexibility in the flow of their workshop and camp sessions. Children also come into CTWorkshop programs expecting to have a good deal of control over their experience, and so may be better prepared to handle the responsibility that accompanies such control. For these reasons, many of the criticisms and challenges presented by constructivist learning are not prevalent in CTWorkshop programs, though such concerns may provide greater challenges in other learning environments, such as a formal grade-school classroom.

Now that we have a foundational understanding of constructivist learning and have considered some of the theory's limitations, we turn our attention to explicit teaching. The following chapter describes the theory of explicit teaching, steps involved in the process of this

teaching method with examples, and examines some common criticisms of this teaching approach.

Chapter 2

EXPLICIT TEACHING

Explicit teaching is often considered the antithesis of constructivist learning. Although CTWorkshop is founded on constructivist methods and does not use explicit teaching in its strict form, some aspects of explicit teaching are modified for use in CTWorkshop programs. Such uses and modifications are described in chapter four which describes how aspects of both constructivism and explicit teaching can be used together in a teaching/learning environment. Since the explicit teaching method focuses on teaching very specific subject matter, this chapter uses hypothetical examples of what explicit teaching might look like if used in a CTWorkshop lesson on the specific use of editing software. Such examples help demonstrate the differences between constructivist learning and explicit teaching, and are also referred to later in chapter four which discusses potential uses for both theories.

What is Explicit Teaching?

When children play a pretend game of school, typically one child acts the role of the teacher and stands at the front of the room, writes on a chalkboard, asks questions and calls on other children who act the role of students. In such play, children are mimicking an instructor - driven method of teaching in which the instructor is in control of all decisions related to the learning process--- not just *what* material is to be learned, but also the *way* that material is to be learned (Biehler & Snowman, 2003). In contrast to the constructivist method in which learners are responsible for forming their own understanding of material as the instructor guides their learning process through questions and feedback, in the explicit method the instructor is responsible for transmitting an external understanding of information to the learner, who is then responsible for processing that pre-determined understanding (Olson, 2003). While

constructivism assumes that learners adapt external information into their own internal schema of understanding, explicit teaching assumes that learners adapt their own internal schema of understanding to conform to external information (Duffy & Jonassen, 1992). Explicit teaching is "highly organized and structured, teacher-directed, and task-oriented" (Ellis, 2005); the process by which the instructor communicates information to learners is linear and follows steps specific to both the content and the instruction. Explicit teaching can also be referred to as direct instruction; however, since direct instruction can refer to several specific explicit teaching techniques and could be confused with direct learning in social learning theory, I use the term explicit teaching to minimize confusion. Just as this general theory of instructor-driven teaching can go by several different names, the process of explicit teaching also varies slightly from author to author. The five steps of explicit teaching described in this chapter--orientation, presentation, structured practice, guided practice, and independent practice--represent those steps most common to multiple descriptions of explicit teaching. As Ronsenshrine describes, "The goal [of explicit teaching] is to move the students through a sequenced set of materials or tasks" (Ellis, 2005). The steps described below are performed sequentially by the instructor in order to efficiently pass on specific information to the learner with as little ambiguity and as little room for error as possible.

Step 1: Orientation

Before instructors can begin teaching a lesson, they must first familiarize their learners with the material that is going to be taught. This includes not only providing an overview of what will be taught, but also placing the lesson in a context that learners can relate to so that they can appreciate why the information is useful (Dell'Olio & Donk, 2007). Just as the importance of context was noted in constructivist learning, context is also important in explicit

teaching in order for learners to understand why they should care about what they are expected to learn. Part of the orientation step also involves providing learners with examples of the completed task so they have a model of what their final product can or should look like (Rosenshine, 2008). Models of final products are not limited to instructor-made solutions, and computer and digital technology can be incorporated into the presentation (Ellis, 2005). As instructors present models of final products, it is important that they explicitly communicate lesson goals and performance expectations that learners will be held to so that learners are clear about what information they will be responsible for (Biehler & Snowman, 2003).

A hypothetical camp lesson on editing software using explicit teaching begins with a general description of how movie editors put all the pieces of a movie together into an organized and polished whole by cutting or lengthening movie segments, adding special visual effects on or between scenes, matching audio tracks to video tracks, and adding titles and credits. This information is put in context when campers are told that they will be learning how to do all those editing techniques so they can enhance the footage they are capturing and improve the production of their final movie. The instructor explains that campers will be learning to use specific editing software, and she can use a projector to briefly show the children what that software looks like and to scroll through a few tools and views in the program. Then the instructor explains her expectation that all campers will complete a coherent final movie that uses at least one example of each editing technique. Finally, the instructor introduces a short movie and explains that it was made by a camper in a previous session and edited using the software the children are about to learn so current campers have a frame of reference for the quality of work expected for their project.

Step 2: Presentation

Once instructors have oriented learners to the forthcoming lesson, they break the overall objective of the lesson into smaller and easy-to-follow steps. Since our working memory can process only about seven points at any one time, breaking materials into steps makes them easier to work through and for learners to remember (Rosenshine, 2003). The creation of steps and sub-goals also makes the task more manageable because learners can focus their attention on making progress through the task piece by piece instead of being overwhelmed and frustrated by the entirety of the whole task. As instructors demonstrate the process of completing the task, they model the type of thinking they want learners to emulate by thinking-out-loud as they work through the steps and by preemptively addressing difficulties learners may encounter so that learners can refer to the instructors' example (Rosenshine, 2008) -- methods of social learning that are addressed in more detail in chapter three. It is in this presentation step that instructors communicate the bulk of the information that needs to be learned, and so it is critical that instructions are thoroughly explained using language that all learners can understand. After presenting the lesson and demonstration, instructors answers any questions the learners might have before moving on to the next step.

For a lesson on editing software taught through explicit teaching, an instructor may divide the editing process into four sub goals: working with video segments; adding and editing audio; adding titles and credits; and converting the project into a condensed movie file. Then the instructor can break each of those sub goals into steps and work through the process of completing each part while thinking-out-loud and troubleshooting potential problems campers might have. The sub goal of working with video segments, for example, could be broken down into the steps listed in Appendix A. While demonstrating these steps for campers

using a projected computer screen, the instructor thinks-out-loud, as exemplified by the quoted sections in Appendix A, to describe what she is doing and to preemptively address potential errors campers might make. As can be noticed from this example in the appendix, the presentation step includes a detailed play-by-play of each step necessary to complete the task of successfully editing video segments so that campers learn how to use these functions of the software and make as few errors as possible. After completing the first sub goal of working with video segments in the larger goal of using editing software to put together a movie, the instructor would then proceed to thoroughly demonstrate the other sub goals in a similar way. She then tells campers that she will repeat these steps as they practice along with her, but makes time to answer any questions the children may have before moving to the next step.

Step 3: Structured Practice

After presenting and demonstrating the process used to achieve the lesson's goal, instructors then work through the process again, this time with each learner practicing along with the instructor. During this step, it is critical that instructors ask learners questions to check and assess their understanding of the material and clarify any confusion (Rosenshine, 2008). However, it is not enough to ask general questions, like "Do you understand?" or questions with one-word answers. Instead, instructors must ask specific questions that require learners to think and provide descriptive responses (Dell'Olio & Donk, 2007). Instructors must also be mindful to call on different children to answer questions instead of calling only on those that offer to respond, as some learners may be too self-conscious to volunteer an answer (Dell'Olio & Donk, 2007). Calling on different learners also allows instructors to assess the understanding of a wider sample of the class, instead of relying on only a few confident responders to gage the understanding of all learners. Instructors should also encourage learners to ask questions

during this structured practice to help learners understand the steps they are performing. As learners ask and answer questions, repeat the steps used to work through a process, and summarize main points, instructors affirm or correct their input (Rosenshine, 2003). Just as it is not sufficient for instructors to ask short-answer questions, it is also not sufficient for them to provide short answers or responses to student questions and input; the instructor's goal in providing feedback and information is not only to teach learners *what* and *how* to do a task, but also *why* those actions are necessary to for the task so that learners understand the importance of each step in a process; such an understanding of the rationale for an action increases the learners' ability to apply similar thinking in other situations and thereby makes the information more transferable. Because elaboration can increase transferability, when instructors correct a learner, they must also explain why the correction is needed. Likewise, when learners give a hesitating right answer the instructor should explain why the answer is correct to build the learners' confidence in their knowledge (Rosenshine, 2003).

For structured practice in a lesson on using editing software, campers would each work at an individual computer while the instructor again uses a projector to work through the sub-goals and steps of using the software. This time, however, the instructor does not recite and explain every step in the process, but calls on campers to explain some steps and why or how those steps are done. The instructor might begin the process by telling the children that they are going to import a video from the My Videos folder, and then she can call on one child to explain how to import the video from that folder. As the child explains the process, the instructor can stop the child during his explanation to ask additional questions about the procedure or provide additional information based on the child's explanation. After the first step has been completed and reviewed, the instructor could also perform the next step herself

and drag the video into the timeline, as described in Appendix A. Then the instructor tells the campers that they are going to cut the video into three different segments at specific points in the movie, and she calls on a different child to explain that process in order to access another child's understanding of the process. Again, the instructor can stop the camper when necessary to ask for elaboration, correct and explain mistakes, or provide additional information herself. As described above, as campers answer questions and describe processes, the instructor must reinforce the explanation of steps to ensure learners understand not only what they are doing, but also why they are doing it a certain way. Campers each work through the procedure step-by-step along with the instructor as steps are explained, asking questions when confused or curious about steps and functions.

Step 4: Guided Practice

After learners have followed the instructor's lead working through the process of completing a task, they then work through the process on their own. During this stage, the instructor does not recite instructions, but walks around the class checking on each learner's progress and correcting errors as they work through the steps. Instead of addressing the entire class, the instructor addresses individuals' questions and misconceptions one-on-one, and tailors responses to meet the individual needs of each leaner (Dell'Olio & Donk, 2007). Although guided practice often has learners work independently and separately on the given task, guided practice can also involve group work with learners working in small teams. Such use of group work gives learners an opportunity to have information explained by someone other than the instructor, giving slower learners a chance to have the information framed in a different way and faster learners a chance to review and reinforce their own learning (Rosenshine, 2003), similar to the functions of conversation and collaboration in constructivist

learning. When using group work during the guided practice step it is important for the instructor to talk to and question all learners in each group, otherwise some could easily dominate the practice session and give little practice to others in the group. This problem can also be avoided in part by making each group member responsible for a different step in the process.

Group work would be an ideal way to conduct the guided practice step of our hypothetical editing software lesson. Campers would work in groups of three or four, and each child would be responsible for completing one or two steps in each sub goal of the lesson. It would be important for each child to be actively responsible for part of each sub goal so that each camper needs to be attentive to the work of other group members and thereby become more familiar with the entire process, not just their own step. If, for example, a camper was only involved in the audio sub goal and was not required to actively participate in the process of adding titles and credits, it would be easy for that child to lose interest and not pay attention to the process of adding titles in the guided practice; if instead the child knows that she is responsible for completing a step in the process of each sub goal, then she is more likely to be attentive to the entire process so that she will be ready to contribute her portion. During the group work guided practice, the instructor would walk around the room answering questions and providing explanation, asking campers questions in order to assess their understanding of the processes, and supporting the children in their learning. This step is the instructor's last opportunity to ensure that campers have an adequate understanding of the information and material before they attempt to complete the task on their own and without the presence of the instructor, and so the instructor must be very attentive to the progress of the campers' learning to ensure they will be able to complete the task autonomously.

Step 5: Independent Practice

After the guided practice step instructors should be confident that all learners understand the lesson well enough to work through the entire process of completing an assignment on their own and without assistance. Learners are not expected to have a flawless understanding of the lesson, but they must understand the steps involved well enough to be able to practice the necessary skills without reinforcing errors or inaccurate information (Dell'Olio & Donk, 2007). For independent practice, the instructor gives learners an assignment to complete at home. The act of practicing a task independently can actually act as a test of student knowledge because, since the instructor and peers are not available to answer or confirm information, learners must rely completely on their own knowledge, and without that external support they may discover that they do not understand the material as well as they thought they did. When learners return to class after having attempted to complete the task on their own, they can voice their difficulties and again receive instructor feedback. The instructor corrects individual assignments and answers questions about the attempted homework, correcting errors so that learners do not continue to practice and further encode misconceptions about the procedure (Dell'Olio & Donk, 2007). Independent practice does not end after one assignment, but involves repeated practice of the task so that learners become more familiar with the steps, making the information more automatic. Our working memory can only process about seven pieces of information at a time, so when information that is needed to complete a particular task is transformed into an automatic process, more of one's working memory is freed for other thinking processes (Rosenshine, 2003).

For independent practice in an editing software lesson, the instructor would assign a small movie project for the children to complete at home and to be reviewed in class the next

day. Campers would be required to create a minute and a half movie file that utilizes the video clipping tool at least once; has at least one video effect on a video segment; has at least one transition effect between video segments; has an opening title screen, at least one title on a video segment, and ending credits; has at least one audio track; and is converted into a condensed movie file. Completed video assignments would also be required to be a cohesive movie that makes sense to a viewer, not simply a hodgepodge of random video, effects, audio and titles. Although converting the project into a condensed movie file is part of the assignment, campers would be required to also save and bring in their saved project in the editing program so that the instructor can review not only the final product but also the work that campers did to make that product. When the campers return to class the next day having completed or attempted to complete their homework, the instructor would go over any questions or confusion campers encountered during their independent practice and review those steps. Because some children might be embarrassed to ask questions, the instructor would also call on campers to describe their work in order to access their progress and understanding of the lesson. After class, the instructor would review each child's movie and editing file, and write a response to each child about their work; although writing a response to each child is time-consuming, it is necessary to ensure that the instructor is addressing the needs of each learner and continuing to support their learning even though the step-by-step instruction of the lesson has already been completed. When the instructor returns the homework assignments and responses, she can address any general errors or confusion common to multiple campers, and assign another short homework project on the lesson. This second assignment could include slightly more advanced uses of the editing software so that

the task does not become tedious and so that learners can build on their basic understanding of the software.

Criticisms of Explicit Teaching

As this chapter and Appendix A describe, explicit teaching involves a very systematic teaching approach that systematically communicates specific information to learners. While this type of approach may enable learners to retain information in order to complete an assignment or test, a common criticism of explicit teaching concerns learners' internal understanding and ability to transfer new information to other contexts (Honebein, 1996). Another common criticism of this method of teaching is that it teaches learners to memorize information but does not teach them the thinking and reasoning skills behind that information (Grabinger, 2001). Many of these criticisms are less about the *theory* of explicit teaching than they are about the working *practice* of instructors using this teaching theory.

Just as with constructivism, instructors often think they are using explicit teaching practices, but are actually missing important elements of the process. As has been described in this chapter and can be seen in Appendix A, thinking-out-loud is a critical component of the explicit teaching process for the exact reason that it teaches learners the reasoning behind each step in the process of completing a task. When instructors fail to explain the reasons for certain actions in the lesson, they fail to model the thinking processes they expect from learners and thereby fail to teach a crucial part of the lesson. Similarly, instructors also must ask learners probing questions that require learners to demonstrate their thinking and understanding of the processes being taught; simple-answer questions that do not require learners to explain their responses provide the instructor with no insight as to whether or not the learner has developed an understanding of the material.

As was mentioned in the introduction to constructivist learning, explicit teaching can be criticized for teaching material to all learners the same way without accounting for individual differences in experience and learning styles. As instructors take questions and call on learners to explain parts of the lesson, they can tailor their responses to learners' individual needs. The guided practice step also gives instructors time to talk with learners individually, especially those that may not have participated in previous steps of the lesson; guided practice provides opportunities for instructors to explain information to individual learners in different ways based on the learner's learning needs and experience (Johnson et al., 2005). While it is important that instructors check and correct an individual learner's understanding of material early in the learning process so the learners does not practice and reinforce misinformation, instructors have another opportunity to address individual needs in their responses to independent work. When instructors write individual responses to each student's work, they can modify their explanations and comments to the individual needs of each learner and thereby address individual differences in learning needs and experience. It is because such individual response supports the individual needs of each learner that it is so important that instructors make time to respond to each learner individually.

Explicit teaching is also criticized for not engaging learners in the learning process; learners can feel "talked to" and bored as the instructor goes through the steps of explicit teaching (Johnson et al., 2005). While the presentation step does involve limited input from the learner, instructors can engage learners in every step of the explicit teaching process by asking questions and getting feedback. In the orientation step of our hypothetical editing software lesson, the instructor could ask campers to name some of the tasks involved in editing a movie instead of simply telling the campers about all those tasks. Even during the presentation step

when instructors are mostly giving learners information, they can engage learners by asking them to hypothesize what happens next in the process or explain why a step was done. Instructors can make opportunities to engage learners in every step of explicit teaching to keep them interested and alert to the lesson.

Although aspects of explicit teaching are useful and used in CTWorkshop programs, the thoroughness and repetition of this teaching method does not make it useful in its unaltered form. The creativity needed for CTWorkshop projects does not lend itself to such explicit instruction, as each child in a given program will undertake a slightly different project and personalize that project in ways that cannot be explicitly taught. Since children are working on different projects, an instructor cannot present one lesson on how to complete the project to the entire class and cannot conduct structure or guided practice on how to complete on project. Children also cannot take materials home for independent practice on use of software or building materials. Such a structured teaching approach may be useful for certain lessons in other learning environments, but is not practical for use in CTWorkshop. However, elements of explicit teaching are very appropriate and are used in some CTWorkshop lessons, as described in chapter four.

Before we explore how aspects of constructivist learning and explicit teaching are combined in CTWorkshop programs and how other learning environments might make use of both theories, we now examine social learning theory. Since chapter four argues that social learning is a common element of both constructivist learning and explicit teaching, it will be helpful to have a foundational understanding of this third theory.

Chapter 3

EXPLORING SOCIAL LEARNING

Social learning can take place in any situation in which people share interpersonal exchanges, as social in this use refers to the way in which individuals behave and interact with each other. It is a natural part of any education situation that involves more than one person, because, as we will see, individuals can gather many different types of information from others even if neither party is aware that the learning is taking place through an interpersonal exchange. When we do not learn from the knowledge and experience we gain through human relationships and interactions, we must rely on gaining information directly from encounters with stimuli without interacting with another person in the process; perhaps we learn by reading a book, watching a documentary, or through our own trial and error in attempting to accomplish a task or reach a goal. Although our development can certainly be enhanced through direct experience with stimuli, social learning allows us to learn from the knowledge already obtained by others without having to experience everything firsthand for ourselves (Bandura as cited by Falik et al., 2006). Learning from social interactions can also expose us to concepts and processes that we would otherwise not be aware of. Although individuals have a level of development that defines their existing cognitive functions such as memory, problem-solving and strategizing, exposure to new processes can aid the development of potential functions that are not yet refined (Vygotsky, 1978). By observing, with various levels of consciousness, the interpersonal interactions that take place between ourselves and others or interactions that take place between other individuals, we can enhance and develop our own abilities and learn how to help others develop theirs.

Why is Social Learning Valuable?

An education system that does not utilize some degree of social learning would look very different from the systems of education that most people are familiar with and would also look very different from the theories of teaching described in this paper. Social learning is such a ubiquitous part of education that it may easily be overlooked, but it is an important part of learning environments. If we thought that direct exposure to information was effective enough for learners to gain a working understanding of all the new information they acquire at school or at other learning environments, we would be able to just give them a book or give them facts without providing additional explanation or needing to help them understand the new material. But we do not expect that learners can understand all the information they receive without additional explanation or reframing of material; we employ people with more knowledge and experience to help learners understand and make sense of new information

Individuals benefit when they learn from the experience and knowledge of others without having to experience everything first-hand for themselves (Bandura as cited by Falik et al., 2006). If a child came to icamp and could not learn from the experience of his more knowledgeable instructors, he would simply be given access to the software and left to figure out how to make it work to complete a project. Perhaps instructors would restate information the child has already read in the program, but they would not be able to reframe the information in more accessible forms for the camper, would not be able to give the child examples, and would not be able to help the child think through difficult concepts; the camper would be completely responsible for learning the skills involved in using the computer program without the aid of interactions with instructors. As can be imagined, this learning process would take a great deal of the child's time, energy, and effort; if the child was able to

benefit from the experience of others, he would be able to invest more energy into developing his ability to apply the information instead of trying to figure out what the information means. As leading social cognitive specialist A. Bandura says, individuals' "intellectual self-development would be stunted if they could not draw on this heritage of knowledge in each realm of functioning and, instead, had to rediscover it, bit by bit, through their own trial-and-error activity" (Bandura, 1989).

In addition to helping learners understand new information that can be applied to a working task, social learning also helps learners understand new information about human relationships. Instructors may have more knowledge and experience than learners about a specific assignment task, such as how to make a video game, but they can also have more knowledge and experience about interpersonal interactions. If, for example, an instructor is explaining information to one child and a second child interrupts expecting the instructor to stop working with the first child and turn her attention to the second, the instructor would need to tell the second child that he needs to wait his turn and she will answer his question after she has helped the first child. Although this exchange does not help the second child understand new information related to a subject task, it does create an opportunity for him to learn about his interaction with other people. He might not learn that lesson right away and might try to interrupt the instructor again later, at which point the instructor can remind the child about needing to wait for his turn, but whether or not he learns that lesson right away or never learns it, the opportunity to learn that lesson is there because of the social exchange. As we will see, opportunities for learning through social interactions do not always take place with the learner's or the instructor's awareness; learners may gain new information or insights from an instructor's unintentional behavior, or may miss new information despite the intentional efforts

of the instructor. While these unintended or missed learning opportunities are perhaps inventible, by learning more about social learning, instructors in all education environments can approach their interactions with others with a more informed awareness.

What does Social Learning Look Like?

Bandura describes social learning as the process by which individuals (including their biological and cognitive characteristics), their behavior, and their environment (including their social environment and relationship to it) all interact and affect each other in reciprocal processes (figure 1), and people learn by observing the effects of these reciprocal processes (Bandura, 1989). As each component interacts and affects another, both are changed and the possibilities for both are altered. If, for example, the icamp staff knows a child with autism will be attending camp a certain week, that knowledge will affect how the camp session and activities are structured. Maybe that means making sure there is a quiet space available for that child if she needs it or seating the child next to a friend she is comfortable with. In any case, before that child has even entered the space, she has already altered the camp environment, and those alterations will affect possibilities for that child and her behavior; if the child needs a quiet space to go to when she is frustrated and does not have access to such a space, she is likely to behave in ways that are disruptive, unhealthy, or even dangerous when she is upset. In this way, the child and her behavior affect and are affected by conditions of her environment. As Bandura explains, the interactions and reciprocal changes that occur through social learning processes create a human component that is both a product and a producer of a person's behavior and environment, because the individual affects and is

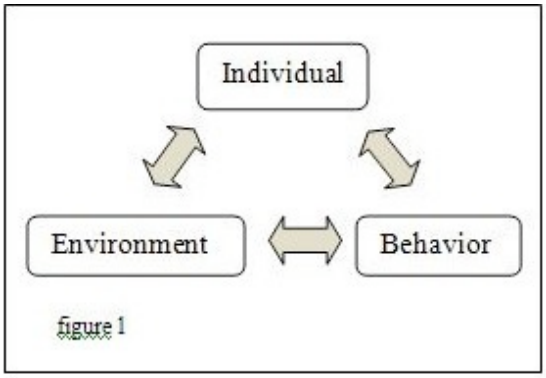


figure 1

affected by both (Bandura, 1989). Having made changes to the child's environment, the icamp staff can observe the interaction between the child, the altered environment, and the child's behavior, and evaluate if and how those changes affected additional changes for each component.

The environmental factor of social learning refers partly to individuals' relationships to their social environment, and the nature of that relationship determines which subset of social learning is taking place. In a direct social learning situation, individuals learn by observing their immediate involvement in an interpersonal interaction (Bandura, 1989) (figure 2). In this scenario individuals reflect, with a varying range of consciousness and depth, on how their behavior affected an interaction with another person, and they use what is learned from that reflection to inform future behaviors in similar social interactions. As an example, consider a camper who does not want to participate in a group break activity because he would rather be on the computer making his video game; the child complains to the instructor that the group activity is stupid, he doesn't want to play, and that he just wants to work on his video game. The instructor responds by explaining that all campers need to take a break from their computers to rest their eyes and their minds, and that although the child will not be forced to participate in the group activity, he will not be allowed to use his computer during that time. If the instructor's response remains consistent in subsequent interactions with that child and other children, the camper will know that complaining to the instructor does not result in him being able to work on his game during group breaks, and this knowledge provides options for him to

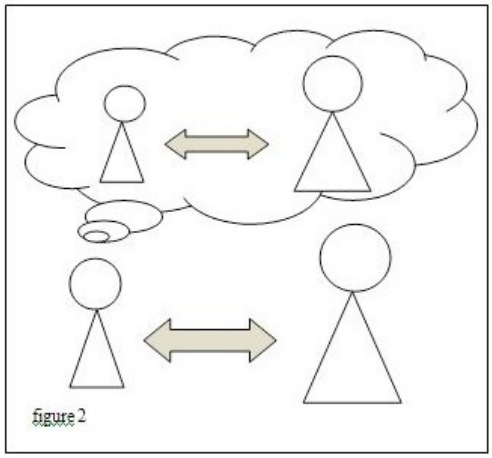


figure 2

change his behavior next time the situation arises. Whether or not the child chooses to change his behavior depends on various factors addressed later in this chapter, but the direct interaction of the camper and the instructor creates an opportunity for learning.

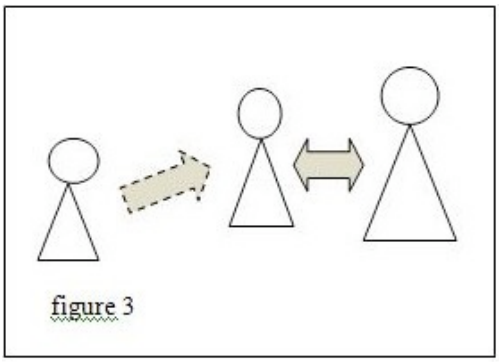


figure 3

Social learning through vicarious observation occurs when an individual is not immediately involved in an interpersonal interaction but watches an interaction happening between other people and learns from that observation (Davis & Luthans, 1980) (figure 3). Individuals watch an exchange occurring between other people and use information gained through that observation to inform their own future behavior in similar situations. Consider a situation in which a camper who has already made one successful program then tries a more difficult challenge on her robotics project but does not succeed in making this second program operate as intended. An instructor commends the child for taking a risk and trying something new. Another child may watch the exchange between the first camper and the instructor and learn through observation that it is acceptable to try new tasks even if you are not sure how to do it; the second camper could therefore be encouraged to challenge himself in his projects instead of just trying tasks he already knows he is good at. As Bandura explains, this type of social learning allows one to learn from situations not experienced firsthand (Bandura, 1989); since our own firsthand experiences are limited, it is to our benefit to learn by watching others so we can refer to that information in future situations we might encounter (Falik, Feuerstein & Feuerstein, 2006).

A third type of social learning occurs when an individual experiences learning that is shaped by another, more knowledgeable person (Falik et al., 2006). In mediated learning, the

more knowledgeable person regulates the learning experience of an individual by controlling factors such as stimulus, duration, and reinforcement to provide an effective learning experience for the learner (Davis & Luthans, 1980) (figure 4). Some forms of mediated learning require the learner to closely re-enact actions carried out by the mediator with little room for variation (Bandura, 1989). Learning to make functional transitions in a video game, for example, requires precise and standardized actions that cannot be changed much if the task is to be successfully accomplished. More abstract types of mediation, such as learning to make digital music, allow for greater flexibility on the part of the learner. In such abstract mediation, the instructor is not teaching the learner how to perform specific actions, but is instead teaching the underlying principles used to accomplish a type of task; the learner can then apply those principles to other, related, types of tasks (Bandura, 1989). In either type of mediated learning, a mediator guides the learning process by selecting the type of stimuli the learner is exposed to, organizing the way in which the chosen stimuli is presented, and regulating the length of exposure in order to ensure the learner can maintain attention (Falik et al., 2006). This intention on the part of the mediator is what distinguishes 'modeling' from 'mediating'. In each type of social learning discussed in this chapter, the interactions and people involved can be considered models, or examples, of learning whether or not the people in question intend or realize they are being looked to as models of behavior. In mediation, however, instructors are not only aware of their roles as models, but also structure their teaching in ways that will make the material most accessible to the learner.

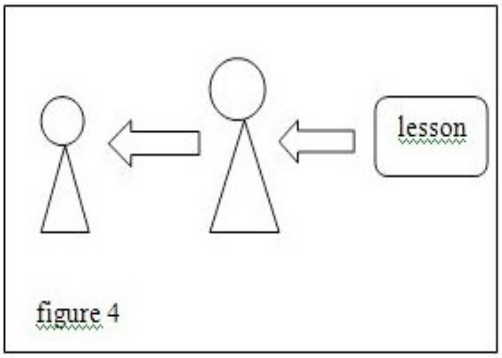


figure 4

Factors the Learner Brings to the Social Learning Exchange

Regardless of the type of social learning that is being experienced, the factors learners bring to an exchange, whether consciously or unconsciously, will affect their receptiveness to opportunities to learn from interpersonal interactions. Information learners have obtained from previous experiences can concur with information gathered in new learning and thereby reinforce those ideas, or the information can conflict. Such a conflict, or cognitive discourse, can either cause people to rethink what was previously thought and thereby develop more complex thinking as they reconcile the conflict, or it can cause people to simply reject the new information so that they do not have to contend with the difficulty of considering conflicting information (Bandura, 1989). For example, a boy could come to icamp with a belief that fashion design is a topic appropriate only for girls. This belief could stem from past social learning experiences in which the boy observed or heard other males claim that fashion design is not manly, or perhaps the boy has seen only girls express an interest in fashion and therefore has never thought to associate males with fashion design. The boy comes to icamp with the assumption that fashion design is not manly, but then sees a male instructor working on a fashion design project that involves designing uniforms for sport teams. The child is faced with a cognitive discrepancy; not only is the male instructor doing a fashion design project, but the context of his project is a subject that is often thought of as "manly". In thinking about this discrepancy, the child can choose to change his initial belief that fashion design is only appropriate for girls, or he can choose to reject that the instructor is engaging in a "manly" fashion design project and hold on to his previous belief. It is likely that the child will not change his mind about the gender associations of fashion design right away; as psychologists

Luria and Vygotsky explain, people tend to require prolonged cultural exposure to ideas before they can make strong connections about the world (Luria & Vygotsky, 1993). But regardless of whether the child changes his previously held belief right away, changes it later, or never changes his belief, his previous experience has affected his receptiveness to the learning opportunity.

A related way that previous experience and knowledge can affect people's perspectives is by shaping their perception of an instructor's intent and authority (Levy, Collins & Nail, 1998). This perception can have a dramatic affect on a learner's receptiveness to a social learning opportunity, because if the learner does not accept the validity of the instructor, than the legitimacy of the instructor's information is also likely to be undermined. If a child comes to icamp and does not take camp instructors seriously because they are not "real teachers", than the child is automatically discrediting the knowledge those instructors have because in the camper's eyes they do not have authority. Similarly, an instructor that tries to encourage a camper to accomplish a difficult task could be rejected by the child because that camper interprets the instructor's encouragement as being insincere and simply a part of his job.

Learners' receptiveness to learning may also be affected by their motivation in a given situation. Bandura describes three types of motivation factors that affect how a person will respond to a social learning experience (Bandura, 1989). In direct motivation, an individual is motivated by the desire to receive an award or to avoid receiving a punishment. If an instructor's response to a child that is talking during a demonstration is to tell her that if she does not stop talking she will be given a time-out, that child is motivated to be quiet because she knows if she is not, she will receive an unwanted punishment. Likewise, if an instructor responds by telling the child that if she is quiet during the demonstration she will be able to

pick the group break game, the child is motivated to be quiet because of the promise of an award in return for good behavior. In vicarious motivation, the child is inspired to behave in ways that reflect the behavior of those she wishes to emulate. If a camper is being particularly helpful and an instructor thanks that child for his assistance, other children who see that exchange may imitate that camper's behavior through a motivation to be similarly praised. If children are motivated by intrinsic motivation, or personal standards, their internal values drive the desire to behave in certain ways. Because personal standards take time to develop in a person, intrinsic motivation also takes time to develop, and learners may be motivated by other factors before they learn behaviors that increase personal satisfaction (Bandura, 1989).

How do Learners React to Social Learning Interactions?

When a person is confronted with information in a social learning exchange, the individual can respond to the situation in different ways or combinations of ways, and with various levels of awareness on the part of the learner. In response to information gathered in a social learning situation the learner might choose to reject new information and simply not accept the information as valid (Levy, Collins & Nail, 1998). The reason for the rejection could relate to the person's previous experience and knowledge, perception, or motivation, as described above. In a reaction of rebellion, learners not only reject the new information, but also act out in opposition to it (Levy, Collins & Nail, 1998). To compare the difference between rebellion and rejection, consider again the male child who comes to icamp believing that fashion design is appropriate only for girls. When this child sees a male instructor engaged in a fashion design project, he could reject the new information by simply refusing to consider the instructor's project as fashion design oriented and instead think of it as a sports project. If, however, the child reacts in rebellion, he might challenge the possibility that fashion design is

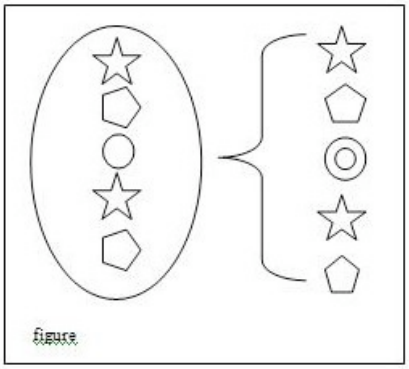
not just for girls by telling other campers that the male instructor is a girl and a sissy. While in both instances the child refuses to accept the new information that fashion design is not a topic just for girls, it is only in the second example that he acts out in opposition to that idea.

When individuals conform to the expressed opinion or desires of another person, they are reacting with compliance; however, the type of compliance depends on the factors that are motivating the behavior. Situational compliance results from direct motivation because the individual complies in order to receive a reward or avoid a punishment (Kochanska, 2002). A child that is asked to pick-up her Legos could obey because she may have learned through previous direct or vicarious experiences that if she does not pick-up the Legos she will not be allowed to use them again later. In this case, the child is complying with the wish of the instructor only because the instructor has control over the situation, not because she believes that what the instructor asks her to do is actually right; although she will obey, she will do so with some reluctance, possibly while rolling her eyes. However, the girl could comply with the request that she pick-up her Legos and do so willingly. In this committed compliance the child obeys the wish of the instructor not only because she believes what the instructor asks is right, but because she actually assumes that desire for herself.

In other types of interpersonal learning exchanges, the learner reacts to the experience by imitating the behaviors of others (Vygotsky, 1978). However, as Vygotsky explains, just because individuals are able to perform certain actions does not necessarily mean that they understand the principles that govern why those actions are important. A camper might imitate the way he saw an instructor wrap a webcam cord, but the child might not understand that the instructor wrapped the cord that specific way in order to protect the equipment and keep the camera attached to its base. Although by imitating the instructor the child does wrap the cord

correctly, because he does not understand the reason why he is performing that action a specific way he is likely to neglect the importance of the action in the future. More importantly, if he does not understand the principles governing how he performs that action he will not be able to transfer that same principle to other tasks, such as wrapping a microphone cord.

Internalization occurs when individuals transfer observed patterns of behavior into their internal system of behavior regulation (Wertsch, 1988). When the principles underlying behavior and the behavior itself is internalized, learners voluntarily conduct themselves accordingly without needing additional supervision (Kochanska, 2002). Internalization involves changes in the recipient's values, beliefs or attitudes that transcend temporary situations to become standard self-regulation (Levy et al., 1998). Because internalization has a lasting effect on the attitudes and behaviors of the learner, it can be considered the most effective outcome of social learning. Whether one considers the behaviors internalized to be negative or positive, if sustained changes are observed in learners, then they have received and identified with new information and incorporated that new knowledge into their internal values. It is important to note, however, that this transference of external behaviors into internal values is not an exact replication. Learners observe patterns of behavior and adapt those patterns to their own needs, personalities, and beliefs (Falik et al., 2006) (figure 5). Consider a group break game of capture-the-flag in which a child is upset because she was tagged out of the game and wants the game to end because she is no longer playing. An instructor is then tagged out of the game, but instead of complaining, he watches the game and cheers for his team. The child



figure

sees this behavior and joins the instructor to be a cheerleader for her own team. Perhaps later in the week a different game is played during group break, and the girl is again out of the game before other players. This time she quietly watches the rest of the game on her own without needing the instructor to first model the behavior; she has internalized the principle of good sportsmanship and watching a game while not participating in it. This is a very simplified example; most likely the child would need several modeled experiences of the behavior and possibly even a description of the principles underlying the behavior before she will transfer it to her own internal regulatory system.

Factors the Instructor Brings to the Social Learning Exchange

Because the instructor can potentially influence the behavior of a learner in a lasting way, the factors that the instructor consciously or unconsciously brings to the learning exchange are just as important as those brought by the learner. Although instructors can engage in a social learning exchange without being fully aware of their participation, the level of the instructor's awareness of the exchange will affect the interaction. Conscious intentionality of goals and stimuli used in the learning interaction enables the instructor to direct the learner's attention to the appropriate stimuli and communicate the goals of learning. As described by the Feuerstein Instrumental Enrichment Program, intentionality requires the instructor to draw the learner's attention to specific stimuli that function in relation to specific goals (Falik et al., 2006). This can be done in part by emphasizing how certain stimuli differ from other stimuli. If, for example, a child working on a video game project does not understand what a sprite is and the instructor tells the child that a sprite is what a character looks like on the screen, the instructor has answered the child's question, but has not connected that answer to the greater goal of the child understanding the principles involved in game design. If the instructor instead

explained to the child that each character in game is made of two parts, an object that does the action in a game and a sprite that is what the object looks like so the character can be seen, than the instructor has provided a more intentional response that relates to the broader goals of the child's task.

As discussed in the section on intention, having clearly established goals for the learning exchange gives the instructor a defined objective by which to organize information and to explicitly communicate the reason and importance of the information to the learner (Falik et al., 2006). Goals may involve teaching specific content information, such as what commands govern specific functions in a robotics program, or can involve developing the learner's cognitive strategies, such as how computer files can be organized for easy access. If the instructor's goals involve developing the learner's cognitive strategies, explicitly communicating how the behaviors being taught can apply to other tasks will help the learner understand how transfer the information; without this explicit communication, the learner is likely to associate those behaviors with only one specific task (Ageyev, Gindis, Kozulin & Miller, 2003).

How an instructor chooses to organize information also affects the learning interaction (Falik et al., 2006). When information is effectively organized, concepts build upon each other in increasing complexity to form a cohesive understanding of the principle or task. Before an instructor can expect a camper to make a smooth stop-motion animation movie, for example, she must first help the child build an understanding of the concepts involved in the process. This might begin with first giving examples of stop-motion movies the child has seen and explaining how those movies were made by making a small movement to an object, taking a picture, making another small movement and taking another picture, and then putting all the

pictures together to create the illusion of movement. Once the child has a basic understanding of what stop-motion animation is, the instructor can begin to build on that understanding with more complex concepts and have the camper experiment with hands-on activities involving those concepts. Organization also involves forming metaphors and examples that make the information accessible to the learner. The instructor may liken how successive pictures are filmed to create the illusion of movement to a flipbook with drawings of a stick figure that seems to move, and thereby create a tangible concept in the mind of the learner.

For an individual to learn and respond to new information, the material must be presented with consistency to prevent confusion on the part of the learner (Wertsch, 1988). If new information is not consistent, than the learner can receive conflicting messages and potentially misunderstand the message being communicated. Consider, for example, the child asked to pick-up her Legos. In the past the child has refused to pick-up her Legos and as a result, the instructor would not let the girl use those materials again later in the day. The same girl notices that another child using Legos refuses to pick them up, but later in the day sees the instructor allow the second child to use more Legos. The first child has now received conflicting messages from the instructor on the use and respect of equipment, the first being that you can only use equipment if you take care of it, the second being that if you do not take care of equipment you can use it anyway. As a result of this inconsistency the first child can interpret the instructor's lesson in several different ways; perhaps she will learn that sometimes you can get away with not taking care of your equipment, or perhaps she will learn that the instructor plays favorites and that some campers do not need to take care of equipment while others do. In either case, the lack of consistency in the instructor's approach affects the learning exchange.

Social Learning, Constructivist Learning, and Explicit Teaching

As mentioned at the beginning of this chapter, social learning can occur in any environment in which people are situated together, and so any education environment that involves more than one person includes some degree of social learning. Although constructivist learning and explicit teaching have some differences in the way learning is approached, both theories utilize social learning, although the degree and type of social learning taking place may differ.

Since the principles of collaboration and conversation are part of constructivist learning as it is described by CTWorkshop, it seems obvious that this learning theory relies in part on interpersonal exchanges to help facilitate learning. In order for learners to talk to one another and collaborate, they must partake in a social exchange, even if the learners involved are not consciously aware that they are learning from each other. In addition to learning from other peers, learners in a constructivist learning environment also gain information from a mediating instructor who guides the learning process through questions and feedback. However, it is this mediation that can raise contentious social learning issues in constructivist learning.

As described in chapter two on the criticisms of constructivist learning, some hard-line approaches to constructivist learning involve very little intervention from the instructor; learners are left to discover knowledge for themselves and largely come to their own conclusions (Duffy & Jonassen, 1992).While such freedom does allow learners to develop their own understanding of information, some mediation is necessary to ensure that learners do not develop misunderstandings of new information and to ensure that learners understand the goals they are working towards. For example, an instructor at icamp could give campers the

materials and equipment needed to make a stop-motion animation, briefly describe how the equipment works, and for the remainder of camp let the children play and experiment with the tools. Without intentionally expressed goals and without specific stimuli relevant to those goals intentionally brought to the learners' attention, learners might not discover for themselves the information needed to complete a task, or even know what task they are trying to complete. Similarly, if instructors do not help guide learners through an organized complexity of information and tasks, learners might not have developed the previous knowledge needed build more complex structures of information. A camper making a video game might want to make a boss level right away, but she cannot take on that complicated challenge until she has developed and understood more basic elements of game-making. While constructivist learning environments do allow learners to direct and develop their own understandings of information, it is the role of the instructor to guide and mediate that learning process.

Conversation and collaboration can also be aspects of explicit teaching when they are used in the guided practice step of the teaching process, but the most obvious form of social learning in explicit teaching is the instructor's role as both a model and a mediator. As an instructor-driven theory, explicit teaching puts the instructor in charge of the learning process, controlling factors such as the material, pace, and reinforcement of the information to be learned (Davis & Luthans, 1980). Instructors using this method of teaching structure their lesson to make the material accessible to their learners, building on basic information with more complex concepts. Instructors also adapt their instruction to individual learners when they answer questions, ask questions, respond to learner input, and provide feedback on independent practice. However, without questions and feedback from the instructor to probe learners' knowledge and understanding, learners might not develop a working understanding of

information.

Although learners may be able to imitate or mimic the behaviors and actions of their instructor, such imitation does not ensure that learners understand why they are performing a task a specific way, as described with the example of the child who imitates the way an instructor wraps the cord of a webcam but does not understand why he wraps it a particular way. If learners simply imitate actions without understanding why those actions are done, they are likely to neglect those actions in the future and will not be able to transfer the skills used for one task to other tasks. Instructors using explicit teaching must have learners explain their understanding of new information to ensure that learners are gaining a working foundation of knowledge. Similarly, instructors using explicit teaching cannot model only the actions of completing a task but must also demonstrate the thinking behind those actions. By thinking-out-loud and describing why certain actions are taken, instructors can further ensure that learners understand not only what to do but why to it and therefore increase the likelihood that learners will be able to transfer their knowledge to other applications.

As can be seen by this chapter, both constructivist learning and explicit teaching theories use social learning practices as part of the education process. How an instructor actually employs the use of either theory will affect the way and type of social learning taking place, but in any case there is some element of social learning occurring in both constructive learning and explicit teaching environments. The following chapter describes how the benefits of constructivist learning and explicit teaching can be maximized and the drawbacks of both can be minimized when elements of both are combined. As will be seen, such combinations also enhance the value of social learning in programs run by Children's Technology Workshop.

Chapter 4

CONSTRUCTIVIST LEARNING, EXPLICIT TEACHING, AND SOCIAL LEARNING: BRINGING IT ALL TOGETHER

We have already, in previous chapters, begun to explore how constructivist learning, explicit teaching, and social learning are all used together in programs run by Children's Technology Workshop. But before we elaborate further on these uses, it may be useful to review some of the concepts associated with each theory. Appendix B and C provide concise overviews of the ideas expanded on in chapters 1-3 and can be referred to for a quick refresher on the discussed theories. It is also important to again note that these examples and descriptions of how these different theories can be used in educational environments are reflective of my own work as an instructor in CTWorkshop programs, and I do not except that these described uses are necessarily directly applicable to other learning environments. However, my intent for this paper is not to design teaching plans for other instructors to use in their own teaching, but to inspire others through my example and experience to think more deeply about their own methods of teaching and possible alternative practices. The following practices are useful in my own work, but others may find that these techniques are not suitable for their own lessons. I do not ask that others adopt my own understanding and uses of constructivist learning, explicit teaching, or social learning; I ask only that others might consider their own perspectives with a little more reflection.

While I argue that an integrated approach to teaching is very appropriate for use in CTWorkshop programs, such teaching is not without its critics. In the discussion of their study of teacher beliefs about teaching, professors and researchers Roehl & Snider (2007) claim that elements of one teaching style may be incompatible with those of another, and therefore

combining practices would compromise the effectiveness of either. Depending on the nature of the material to be learned and the expectations of how that material will be used by learners, I can understand how a more pure constructivist or more pure explicit teaching approach could be more beneficial than a combined practice. However, the material and expectations of the knowledge that learners experience in CTWorkshop programs is such that instructors can have flexibility in their approach. Rather than being responsible for insuring the foundational knowledge that children are formally tested on, CTWorshop instructors are tasked with providing children with opportunities to "explore, invent, and create" in educational enrichment programs that are designed to enhance learning. As such, CTWorkshop instructors may have greater leeway to use integrated teaching styles than instructors in other educational environments.

Roehl & Snider (2007) also point out that teachers who use multiple "teaching methods may not use any of them with enough skill to produce results." While this statement may be true, it is not an argument against integrated teaching so much as it is an argument for thorough teacher training in general. Both constructivist learning and explicit teaching can be inadequately practiced by instructors, such as when "constructivist teachers" prematurely correct learners too early and do not allow students to learn from their mistakes, or when "explicit teaching teachers" fail to explain the thinking behind their procedures or fail to prod student thinking through questions. Teacher training is an integral part of any teaching practice, and a combined teaching approach can be practiced with as much skill as either constructivism or explicit teaching when instructors are appropriately trained and informed. With proper preparedness and training, educators can combine elements of constructivist learning and

explicit teaching for effective teaching practices. Such a combination of practices can maximize the advantages of both theories while minimizing their disadvantages.

A main advantage of constructivist learning is that it gives learners a chance to build a relationship to their knowledge and develop "the experimental skills, knowledge and beliefs" needed to make information useful and transferable (Olson, 2003). However, a disadvantage of constructivist learning is that it can be difficult to ensure that the understanding of knowledge that learners are developing complies with "the recognized body of socially sanctioned knowledge" that exists in the wider world (Olson, 2003). While it is important that learners construct their own working understanding of new information so that the knowledge is useful and transferable, that personal understanding does need to reflect factual knowledge widely understood to be true. In their book *Constructivism and the technology of instruction: A conversation*, Duffy and Jonassen (1992) explain that an individual's understanding of known information is akin to individual uses of a common language such as English: "We can assume that the semantics of each individual's knowledge is different, but the structure of that knowledge is the same, similar to how sentences in English can be said differently but still have the same meaning."

The obtained accuracy of learners' knowledge is a strong advantage of explicit teaching, but the corresponding disadvantage with that theory is that it often teaches learners only one way of completing a task and can result in a low transferability of skills and knowledge. While a learner may be able to follow and replicate the process an instructor uses to accomplish a goal, this imitation of action does not necessarily mean that the student understands why certain steps are important to the process. Consider again the example in chapter three of the child who watches an instructor wrap the cord around a webcam a certain

way, but does not understand the principles governing why the instructor wrapped the cord that way; the child may wrap the cord around the webcam correctly, but since he does not understand how that method of wrapping protects the equipment, he will be unlikely to transfer that knowledge to other tasks, such as to wrapping a cord around a microphone. Even if teachers using only explicit teaching explain the reason for their method of wrapping the cord around the webcam, the child is unlikely to internalize the importance of the lesson if he does not develop an individual relationship to that information through personal engagement. Supplementing an explicit teaching approach with elements of constructivist learning can help ensure that learners are not just imitating instructor behaviors but have internalized an understanding of the principles that guide specific actions.

As noted in chapter one, a criticism of constructivist learning is that without sufficient instructor mediation, learners may not understand enough of the information to begin building their own construction of knowledge and also might not understand the objective or goals they are striving for. Conversely, a criticism of explicit teaching is that instructors can provide too much information and not give learners a chance to explore and develop their own understanding of material. An integrated teaching approach that combines these theories can mitigate such criticisms by ensuring that instructors approach the learning exchange with enough intentionality to clearly define learning goals, organize information to help learners construct increasingly complex knowledge, guide the learner's attention to relevant stimuli, and provide consistency in their interactions with learners, while also giving learners enough flexibility and freedom to build their own working understanding of new information. To quote an article by educational psychologist Richard Mayer (2004), "Students need enough freedom to become cognitively active in the process of sense making, and students need enough

guidance so that their cognitive activity results in the construction of useful knowledge." An integrated teaching approach can provide just such a balance.

Combining elements of constructivist learning and explicit teaching can also enhance the social learning opportunities available to learners. As described in chapter three, social learning is valuable because it allows people to learn from the knowledge and experience of others without having to experience everything firsthand for ourselves (Bandura as cited by Falik et al., 2006). Additionally, social learning also exposes people to alternative thinking and behaviors as we observe and interact with others. While collaboration, conversation, and group work is a part of both constructivist learning and explicit teaching theories, in practice explicit teaching can neglect these aspects of social learning. Similarly, instructor modeling and mediation is also a part of both theories, but can be neglected in the practice of constructivist learning. By using a combination of these teaching methods, instructors can better ensure that benefits of different types of social learning are realized in their educational environments.

The learning environment of icamp is an ideal place to realize the benefits of combining constructivist learning and explicit teaching practices, as the program is designed for children to develop creative technology skills. Although the creative nature of their projects gives campers a great deal of flexibility in the uses of different software programs and computer equipment, most technology tools will only function properly if they are used a certain way. For example, all campers will use editing software to edit a mini-movie of their individual projects; different campers may use different features and effects of that software, but the basic logic of how the software functions is the same regardless. All campers will use the same basic process to import a video file into the editing program, because that specific process is how the program is designed to perform that function. How campers use the videos

they import can vary depending on their project and their creative vision, but some key steps of using the technology tool are the same. For steps that all campers need to have an accurate understanding of, it is useful for an icamp instructor to lead an explicit lesson in the basic use of the editing program. Such a lesson may resemble the think-out-loud presentation described in Appendix A, with the instructor showing campers how to do certain steps and thinking-out-loud to describe why those steps are important. Since all campers will have some type of credit in their final mini-movie, the instructor might also have campers perform a structured practice of creating titles, with children creating their own credits on their laptops as the instructor leads the process on a projector. However, after laying an introductory foundation of information on how to use the editing software through these two instructor-lead practice steps, campers are free to explore the software on their own in their own time, experimenting with different features, learning from mistakes, and asking instructors for additional assistance. During this stage of camper experimentation and engagement, instructors provide few direct answers to student questions, but instead help campers figure out how to solve issues on their own through questions, thinking-out-loud, and feedback, allowing children to develop their own experience with the information based on the initial explicit foundation of information provided earlier.

Because children at icamp use what they learn at camp for their own creative projects, it is usually easy for instructors to identify when children have not internalized their own understanding of new information and have instead simply imitated the behavior of someone else and have therefore not developed a transferable understanding of a new skill. Consider two children working on separate stop-motion animations. One child steps up his camera to look down on the set of a Lego spaceship traveling across a Mars surface. The second child sees this and arranges his camera in a similar set-up to film a scene of two paper characters taped to a

backdrop. An instructor that sees this second setup can ask the second child if his flat characters on a flat backdrop will be seen in a downwards camera angle and access why the child decided to film his scene this way. Since the creative technique of the first camper is not appropriate for the creative project of the second, the instructor can determine that the second camper has not developed his own internalized understanding of why certain camera angles are used and has simply copied the action of the first camper. This observation gives the instructor an opportunity to engage the second camper in a discussion about the use of different camera angles and help the camper develop his own working understanding of the principles used to determine appropriate camera positioning.

Instructors at icamp do need to make sure that learning and performance goals are made clear in order for campers to understand what they are working towards in their week at icamp. Most children come to icamp not really knowing what the program is about or what they will be doing during the week, and when instructors do not clearly articulate the learning and performance goals campers should be working towards, children become confused, frustrated, and even bored without some defined expectations. Even though the expectations of campers at icamp are somewhat loose and abstract, they need to be articulated so that campers understand the expectations of their experiences in the program. Similarly, instructors at icamp need to organize information so that children just being introduced to specific technologies can begin to develop their understanding of that technology with basic concepts, then build to more complex ideas associated with that technology tool. Icamp instructors have more experience and familiarity with specific tools and their uses than campers do, and they need to organize their mediation of camper learning to ensure that they do not introduce children to complicated concepts before the camper has a basic understanding of the tools being used. Perhaps a child

is working on her first movie project and is just starting to learn how to work the camera and the capturing software. If an instructor starts telling this camper how to use more complicated filming techniques, like using the software generated green screen, before the child has even developed an understanding of basic film capturing, than the instructor is not organizing information about filming in such a way that the camper can first develop a basic understanding of the process. While instructors in these situations are well intended, such practices do not give the learners the basic knowledge they need to develop more complicated ideas and therefore increase the child's dependency on the instructor rather than giving children the freedom to work with new information on their own. If an instructor helps a child working on her first movie project start filming a movie with a digitized background, that child will need the continued help of the instructor because she does not have the foundational information needed on which construct more complicated knowledge of filming. Instructors must organize the information they relay to children that have less experience so that they can assess the learner's current understanding of information and gradually increase the complexity of the ideas explained.

The combined use of constructivist learning and explicit teaching methods make icamp a rich environment for social learning opportunities for both instructors and campers alike. Constructivist elements of the camp environment encourage collaboration and a circular flow of information and knowledge in which instructors and the camp director can learn vicariously by observing each other's interactions with campers and by observing interactions between campers, rather than a hierarchical flow in which information flows from the top down from the director to the instructors then to campers. The circular nature of the director/instructor relationship is a model to campers of the collaboration and teamwork that is also encouraged in

the relationship between instructors and campers and between the campers themselves. While not every camper at icamp embraces that collaborative spirit, many campers do learn from these examples and become increasingly engaged in helping and sharing their own ideas with other campers and with instructors, receiving help and ideas from them, and working collaboratively with others to brainstorm and develop new ideas. Every child at icamp works on their own individual project, but campers usually help each other with aspects of their projects, such as by holding the camera to film a movie scene, thinking through an aspect of video game programming, or brainstorming creative ideas about project stories. Children who help each other and share ideas not only learn from the experience and knowledge of their peers, but also build support and interpersonal relationships with other campers, and such relationships enhance their icamp experience, just as camaraderie between instructors enhances their work environment.

In addition to providing models of social behavior and general thinking skills through the example of their own conduct, icamp staff also provide more direct and explicit modeling when conducting more formal lessons, such as in the earlier example of an instructor leading a lesson on how to use the editing software: The instructor demonstrates the use of the program while thinking out-loud to explain the reasoning behind her actions, then has the campers follow her lead as they practice on their own computers before they go of on their own without her leading.

A more personal type of modeling occurs when instructors talk to children about dealing with frustration, stress, and anger. Both instructors and children at icamp will naturally deal with frustration and stress as they encounter technological or personal difficulties. While computer freezes and personal frustrations are challenging, one of the most important jobs of

an icamp instructor is to model and teach children healthy coping and problem solving strategies. Perhaps an instructor is trying to teach a camper how to use a digital art tool by working with his own personal art project, and he hits a wrong button and deletes his project and cannot undo the deletion. If the instructor dealt with that problem by taking his anger out verbally on other instructors or campers by being unnecessarily harsh or hostile, he would be modeling a poor coping strategy to the observing camper. Instead, an instructor at icamp might deal with such a frustration by taking a deep breath, telling the camper that he was very upset about losing his project and explaining that he needs to walk away from the computer and take a walk down the hall by himself to calm down before he would be ready to move on. Technological problems are inevitable at a technology camp, as are personality conflicts when children are together for eight hours a day five days a week. It is not uncommon for an instructor to lead children through a discussion or lesson about coping and problem-solving strategies to further help campers learn how to work through such challenges.

The combined uses of constructivist learning and explicit teaching practices are part of what makes the icamp experience rewarding for both campers and instructors alike. Because campers are working on projects of their own invention and have a great deal of control over what technology tools they get to learn about and also have a great deal of control over how they get to use those technology tools, they become so engaged in their projects that parents have to practically drag them away from their computers and Legos at the end of the day. Campers are engaged and invested in their projects, and they are eager to learn new and complex concepts because that learning occurs in the context of tasks they have largely defined. Often campers do not even realize that they are learning so much because they associate the process of obtaining their new knowledge as something fun. Children at icamp

even become engaged in more explicit lessons such as the examples of how to use editing software. Instructors intentionally engage campers in such lessons by letting them make suggestions, asking them questions, and providing silly examples that keep the children entertainingly alert through presentations. Children also are engaged because they know they will be applying the new information to their own projects, and want to learn more about the tools they will be using so they are more familiar with their options. Since most of the software used at icamp is either free or affordably priced, once children learn how to use these tools they can use their newly acquired knowledge outside of camp and continue working with those new ideas even after icamp is over. When parents report that their children are using these tools successfully at home, and when returning campers come back to icamp not only remembering what they learned last session but also having expanded on that knowledge on their own, icamp instructors see the success of their teaching methods. Additionally, the social learning children gain at icamp often has a lasting impact of campers, and it is not uncommon for parents to report changes to their child's behavior. Such reports of changes in a child's personal behavior indicates that the child has internalized lessons gained from the icamp experience.

Icamp instructors are energized by the energy of children excited about their work, and that energy keeps instructors going through the week and summer. Icamp can be very exhausting for instructors because there is a constant demand of physical energy to check on and help all the children, an intellectual energy to be familiar with all the technology tools and keep track of each camper's needs and progress, and an emotional energy to support frustrated, overtired and/or cranky campers. But the excitement and accomplishment most campers show during their week at camp is invigorating. The collaborative nature of the staff relationship also allows instructors and the director to support each other, share ideas, and learn from each other.

Such an atmosphere makes for a cooperative work environment in which all staff members contribute to the success of the camp and in which all instructors can develop and improve in their own teaching and interpersonal interactions.

Despite the glowing description above, icamp and its instructors are not perfect. As mentioned earlier in this chapter, instructors do need to be mindful of organizing information in appropriate ways so that campers less experienced with certain types of technology tools can develop a basic understanding of those tools before moving on to concepts that are more complicated. Similarly, because icamp instructors are so familiar with the projects and expected outcomes of icamp, it can be easy for them to forget that many campers are not familiar with and do not know what to except from the icamp program. When the program is not described and objectives-- however flexible those objectives might be-- are not explicitly articulated, children do not know how to intentionally direct their attention to reaching a goal, because that intentionality and goal was never explained. This is especially true of the final movie project, because although children start the week knowing they will make a mini-movie, they often do not understand what that mini-movie might look like or its purpose.

These deficits of the icamp program generally stem from understaffing and a lack of training. As a small and relatively new location, the Boston CTWorkshop branch has had few resources to train instructors in actual instruction and has instead focused training on technology tools; as a result, most instructors have develop the method of their own instruction mostly through experience and trial and error. Now entering its fourth year, the Boston branch has established itself adequately enough to provide additional training, and this year will be conducting formal training session with both prior and new employees to ensure that all instructors are “on the same page” in regards to program expectations and instructional

priorities. CTWBoston also now has the resources to hire additional staff; the first two years of icamp were staffed only by the camp director. It was not until last summer that he had the support of any additional instructors, and after working by himself for so long, it is understandable that it would take time for the director to adjust his teaching approach so that he can communicate and work effectively with his new staff. With a bigger staff, more and improved training, and more experience working as a team, icamp instructors will be better able to integrate constructivist learning and explicit teaching practices, and continue to improve both their own instruction and the icamp experience.

CONCLUSION

"FINAL" REFLECTIONS

Rather than writing a formal conclusion section summarizing the outcomes of my research and plans for the future, I have written a "final" reflection section. I say "final" because they are only final in the sense that they are the final piece of this synthesis document; they are not final in my own mind, because I expect that over time and as I gain more first-hand information from my own future teaching experiences, whatever learning environment those experiences might be in, my understanding and use of these ideas will continue to grow. For similar reasons, I have referred to this section as "reflections" rather than "conclusions", because while this section does end my synthesis, it does not end my thinking about these concepts.

Before I reflect on how learning and thinking about these theories of constructivist learning, explicit teaching, and social learning in the context of working at Children's Technology Workshop, I would like to comment on my experience with the process of writing this synthesis.

Reflecting on My Synthesis Process

This project has seen several evolutions and undergone several significant changes in direction since I began thinking about and researching topics. Originally I had planned on writing about the importance of the Arts to developing community culture, and obviously the document you have just read is quite different than that idea. My process in developing and even in writing this synthesis has not been linear; once I decided to write about learning and teaching, I did not go into this topic with a planned outcome of what the uses or significance of the information would be for me, but instead let my ideas and direction form as I read, thought,

and learned more about these different concepts. Similarly, I did not write this document by starting at the introduction at the beginning and writing through to the end, but rather started in the middle, then went back to the beginning, then went through the whole paper to update and modify my work before writing the final chapters. I did not know, when I started, what themes and meanings I would find in these theories of constructivist learning, explicit teaching, and social learning, but I knew that before I was done, I would find those answers.

While the process described above might seem unremarkable to some, it has been remarkable to me because it has been so different from my typical writing process. In the past, I have always begun a project or paper with a clear and established thesis and purpose; the details of my thinking on the topic might have changed slightly in the course of writing, but I always went in with a very clearly defined objective in mind. From that objective, I would plan my paper from start to finish and then set about writing it linearly from beginning to end. Of course, I would go back and revise previous sections throughout the writing process, but the bulk of my writing happened one sentence at a time, building it from the introduction straight through to the conclusion.

Perhaps even more significant than the fact that I broke away from my standard process for this project is that I was comfortable with this departure. Even though I did not know where I would end up, I trusted the process and let it lead me without worrying too much about the final product. What little anxiety I have had about this synthesis related more to understanding and thinking about the content of the material than about the final document. Again, this might seem unremarkable to some, but it represents a considerable change in me as a student graduating from the Critical and Creative Program compared to me as a student first entering the program. As mentioned in the introduction, my previous experiences as a student were

based on receiving information from and giving that information back to a teacher, and as an undergraduate student I was very good at and very comfortable working in that structure. However, as those familiar with the Critical and Creative Thinking program already know, CCT classes are much more constructivist in that students are expected to find and develop their own meaning of information, and the professors are there as mediators to guide that learning process. In my first semester in CCT, realizing that I needed to take more responsibility for my own learning was extremely stressful; I was constantly worried about my final products and could not let go of enough of that anxiety to make the most of the process of working towards the outcome. The fact that now, as a graduating student, I can approach such a major project as my synthesis by letting the process of working on it lead me to develop the final product without fretting about that outcome, demonstrates how much I have grown and learned in the past two academic years. Because I could approach this synthesis in a process verse a product based mentality, I have been able to appreciate and internalize these concepts better than if I had been primarily driven by producing a final project product.

One could argue that the fact that my project concerns formal theories of learning/teaching indicates that I have not developed much independence as a learner during my time as a CCT student compared to my experiences as a student prior to joining the program. It could be argued that I am still relying on other people's structures and ideas to make my own. However, I argue that rather than relying on the structure of these theories to form my own ideas, I am referring to these theories and their authors more as "knowledgeable people" and learning from their experiences and ideas, similar to how we learn socially from one another. Rather than committing my loyalty to one specific structure or even one specific

combination of structures, I have used the theories described to inform my own teaching interactions.

Reflecting on Constructivist Learning, Explicit Teaching, and Social Learning

Working on this synthesis has made me appreciate the myriad of ways that human beings learn and teach each other, and has also made me more consciously aware of my own role as a learner and instructor in various types of learning exchanges. As an instructor at Children's Technology Workshop who came into icamp with little prior experience working with children in the 7-13 age range and had no previous educational background in teaching, studying these formal learning/ teaching theories has given me an informed foundation on which to construct my own ideas about how to lead various types of instruction. Working on this synthesis has also given me more confidence as an instructor, because now I have a better understanding of why certain teaching techniques are effective and/or beneficial for the learner. For example, before I started this project it was very difficult for me to watch a child make a mistake in building or programming without stopping them to have it corrected. After learning more about constructivist learning, I have a better appreciation for the value of learning from one's mistakes and using that experience to further one's own understanding of information, and so I have grown much more comfortable with letting children discover some of their errors for themselves.

Learning about explicating teaching and social learning has also helped me appreciate my instructor role as a model of thinking and action when leading children through a process. Instead of simply demonstrating how to use a specific software tool or solve a problem, I now focus just as much on thinking-out-loud to explain my thought process as I show children how to use the tool in different ways or as I try to figure out what is wrong with their program or

design. Similarly, I am also much more conscious of the need to ask children probing questions and make them explain their own thought processes to me when they are working on a task. Since I have always questioned older students that I have tutored to explain the reasoning and thinking behind their writing, it seems strange to think that I was so hesitant to question younger students in a similar way. However, through this project I have also gained a deeper appreciation for the developing young minds contained in the heads of young people.

When I first started working with Children's Technology Workshop, I think I was intimidated in my interactions with the children because of my limited experience working with that age group, and I did not understand how to modify the teaching techniques I use with older, more experienced students to use with younger, less experienced students. Children do have less life and educational experience than the college students I work with, but I have come to appreciate that that fact makes it even more important that I consciously try to help young people develop as thinkers and learners. Because they are just beginning to develop their understandings about patterns in the world around them, just beginning to develop thinking habits, and just beginning to develop a sense of their own interests and strengths, it is important that I, whether as a formal instructor or as a potential informal social model, help encourage and teach children to think more deeply about their own thinking and reasoning, not only by modeling such thinking myself, but by stimulating children to articulate and therefore think about their own thinking.

Since learning about these formal theories has improved my own understanding of why certain principles and practices are important in educational exchanges, it has also improved my ability to talk about CTWorkshop and why our programs are unique compared to other groups that run technology programs for children. In addition to some teaching, I also do most

of the writing for CTWorkshop Boston, including our monthly newsletter, company blog, program descriptions, and promotional ads. Having a deeper understanding of how learning/teaching exchanges happen in our educational environments has made me better able to explain our philosophies and programs to outside parties, such as parents and venue partners. Such explanations and associated writings are part of our marketing plan; however, I do not think "marketing" is a bad word as long as you believe in and personally value what you are promoting. Working on this synthesis has given me a better understanding of why CTWorkshop programs are valuable and increased the personal fulfillment I receive from working with the company, and I am happy to help "sell" what I believe to be a worthwhile resource for children.

Although this synthesis has explored learning and teaching in the context of my work with CTWorkshop, working on this project, and in particular reading about social learning, has contributed to a larger appreciation I now have for the many different environments and situations in which one can both a learner or an instructor or even both together. Social learning can happen in any situation in which people share interpersonal exchanges, and while in practice I have likely taught others by my own example and have certainly learned a great deal by observing the example of others, in the past those exchanges have taken place largely without my recognition. Having read about these theories of learning and teaching, I have a deeper understanding of factors that influence social learning and how those learning exchanges can impact people and am therefore much more conscious of my own influence on a given situation and much more considerate of how another person is influencing a situation.

Now my understanding of situations in which I can teach others or be taught by others has also been consciously expanded, and I have come to consider many more types of

situations and activities as educational exchanges. I do not know how long I will work with Children's Technology Workshop nor do I have a defined objective of what job I would like to next pursue. I have a wide range of interests and can foresee myself involved in many different job roles, such as running after-school programs, writing for an alternative press, fostering the Arts through a non-profit organization, or working in the renewable energy business, to name a few. While my interests may seem broad and unrelated, I now see an important common factor them all: They all are a form of teaching. That teaching may come through exchanges between an instructor and a student, a journalist and a reader, or an organization and its community, but I believe all my future professional roles will largely center on teaching others through my own example as some type of model and by raising awareness on various topics by situating others to think more deeply.

As has been mentioned repeatedly throughout this synthesis, I do not expect that others will come away from this paper with the same understanding of these ideas that I have developed. I do not expect that my own experience in learning about, working with, and reflecting on constructivist learning, explicit teaching, and social learning is directly related to the experiences of my readers. However, my synthesis may represent the themes which the theories discussed in the following ways. I have explicitly presented you, the reader, with specific information which I have tried to articulate clearly and efficiently so as to leave little room for ambiguity; while my experiences may not be the same as your own, they can be a model and you might learn something from observing my example; Now that I have given you both explicit information and modeled an example, it is up to you to construct your own meaning for the ideas in this paper. I hope your process and reflections will affect you as deeply as mine have.

APPENDIX A

STEPS AND THINK OUT LOUD FOR EDITING VIDEO IN AN EDITING SOFTWARE LESSON

1**. Import video clip:** "All the action tools you need to use in this program are located here on the left side of the screen. First I'm going to import the video I need by clicking Import Video, searching for the appropriate folder, then double clicking on the video I need. This makes a shortcut so that the editing software can find my video when it plays my movie, but that does not mean that there's a copy of the video in the editing program; it just means that the editing program knows where to find this video. If I move the original video to a new folder or different location, the editing program won't be able to find it because the path of the shortcut won't work anymore, and then it won't play in the program."

2. **Place imported clip in movie timeline:** "This timeline at the bottom of the screen shows me the order and length of everything I put in my movie. I just drag my imported video into the timeline and the numbers on the top show me how many seconds my video will play for. Right now I have a video that is 20 seconds long. Let's preview this video and see what it looks like. This right arrow under the preview window will play everything that's in the timeline."

3. **Clip Video:** "Right now I have a video that is 20 seconds long, but I have ten seconds in the beginning where nothing happens. Since my whole final movie can only be a total of two minutes, or 120 seconds, that ten seconds at the beginning where nothing happens will really cut into my time to tell the story, and it's also pretty boring to watch. So I want to cut the beginning of my video so that there's less down time at the beginning. Under the preview screen here, you see two arrows with three lines next to them; those let me move through my movie one frame at a time so I can find the exact second that I want to cut my video. When I fast-forward frame by frame, the first movement in my video happens right at this frame, so I want to cut my video a few frames before, so that we have just a little bit of stillness before the action starts. I want to have just three seconds of stillness before the action, and I have ten seconds of stillness right now, so how many seconds do I need to get rid of? (calls on student for answer and confirms or corrects response). We know that there are ten frames in every second of film, so if I want to delete seven seconds of footage, how many frames do I need to delete? (calls on student for answer and confirms or corrects response). So I'm going to rewind through my frames and I want to stop right here. Now I want to make a cut in the video so that I'll make this one video I have into two separate segments, and I do that by clicking this scissor icon here under the preview window. Now you see that I have two separate pieces of video from my first whole clip. Then I can right-click on the first segment that I want to manipulate-- usually I use the left click button on the mouse to select an item, but I use the right click button if I want to see action options for that item-- and you see it gives me several options of what I can do to this piece; I can copy it, add a special effect, I can cut it so I can paste it somewhere else. But I just want to completely get rid of this piece, so I'll click delete. Now when I play my movie, we have just three seconds of stillness at the beginning and then the action starts."

4. **Add Special Effect:** "This movie is pretty old-fashioned; there are horses and buggies, the people are wearing old-fashioned hats and suits, so I want to add some special effects that make the movie film look old. Remember, all the action tools for this program are listed on the

left side of the screen, and I want to add an effect to my video so I'm going to click on Video Effects. This lists all the effects I can add onto a video: I can slow it down or speed it up, I can zoom in a certain part of the screen so that's the only part that shows, I can make the video warp or move in different ways, and I can add different color effects to the video. I'm trying to make my film look old, and here we have an effect called Film Age, Old. But I want to see what that looks like before I add it to my movie, so I'm going to double click on this effect and it plays in my preview window. That effect is very appropriate for my movie, so I'm going to drag this effect down onto my video in the timeline. Now you see there's a blue star in the corner of the video on the timeline, and that star tells me that there is an effect added to this piece of video. I can add more than one effect to a video, so now I want to change the color of my movie to make it look older. As I look through the effects, I see two color effects that might be good for making this movie look old. Here's one that makes the movie play in black and white, and here's another that plays the movie in shades of a light tan color. After previewing both, I think I like the second one because the tan colors make the film look kind of aged, so I'm going to drag that effect onto the video in my timeline. Now you see the video clip has two blue stars on it because now I have two effects on this one video. Now let's see what the movie looks like with both of these effects. After watching the video play, I'm not sure that I want to use the tan color effect after all; I want try the black and white effect instead. But before I add the black and white effect, I need to delete the first color effect I have on my video. To do that I use the right click button on my mouse, and it shows me a list of actions I can do with this video. I want to change an effect, so I click on the effect option. On the left side of this display I see a list of all the effects I could use on this clip, and on the right side I see a list of effects that are actually on my video. In between both these lists are actions I can take with effects, so I can also add or remove effects from this screen. First I want to remove the tan color effect from my video, so I select that effect from the list on the right and select remove. Since I already know which effect I want to add to my video and don't need to preview it, I now go to the list on the left and select the effect I want to add, click the add button, and now that effect is on my list of effects that are on my video. Now I need to save those changes I just made to my video, so I click ok. Let's play the video again and see what it looks like now that I've changed the effects. I like the way the black and white effect makes the movie look like it was made a long time ago, and with the old age effect my movie looks old, which is what I want. So by using the editing software I was able to alter my original video clip that I imported into the editing program and make changes to it that enhance how I'm telling this story visually."

APPENDIX B
CONSTRUCTIVIST LEARNING AND EXPLICIT TEACHING OVERVIEW

Theory	Characteristics	Principles/Steps	Advantages	Disadvantages
Constructivist Learning	- Learner-driven - Learner develops own relationship with and understanding of information - Instructor provides little direct information; mediates learning through questions and feedback - Bulk of instruction happens as learners use and work with information	- Active Engagement - Constructive - Intentional - Complex - Contextual - Collaborative - Conversational - Reflective	- Learners develop own working understanding of information - Knowledge gained is transferable to other applications	- Difficult to access learner understanding - Instructor may provide too little or too much assistance in learning process - Demand time and energy of instructors
Explicit Teaching	- Instructor-driven - Efficient and accurate transferal of information - Instructor modeling of process and thinking - Assessment of learner comprehension through questions and feedback - Bulk of instruction happens as instructor tells students information	- Orientation - Presentation - Structured Practice - Guided Practice - Independent Practice	- Instructor modeling provides example of expectations - Defined goals and steps provide clear task objectives	- Learners may not be engaged in the learning process, can feel "talked at" - Instructor may neglect thinking-out-loud explanations of process - Information gained can have low transferability to other applications

APPENDIX C
SOCIAL LEARNING OVERVIEW

Type	Characteristics
Direct	- Individual learns by reflecting on their immediate and direct involvement in an interpersonal exchange
Vicarious	- Individual learns by observing an interpersonal exchange occurring between other people and uses information gained through that observation to inform their own future behavior in similar situations
Mediated	- A more knowledgeable person regulates the learning experience of another individual to provide an effective learning experience for the learner

Participant	Factors Brought to Exchange	Reactions
Learner	- Previous experience - Perception of authority - Motivation	- Rejection - Rebellion - Imitation - Internalization
Instructor	- Intentionality - Organization - Consistency	

Learning/Teaching Theory	Social Learning Components
Constructivist Learning	- Collaboration - Conversation - Mediation
Explicit Teaching	- Instructor modeling - Collaboration & conversation in guided practice steps

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