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DEVELOPMENT ARTICLE

The Studio experience at the University of Georgia: an example of constructionist learning for adults

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Abstract The Studio curriculum in the Learning, Design, and Technology (formerly Instructional Technology) program at a large research-extensive university in the southeastern U.S. represents a deliberate application of contemporary theory of how adults learn complex information in ill-structured domains. The Studio curriculum, part of a graduate program leading to a master's degree, has been implemented since 1998 to prepare professionals to design, develop, evaluate, and manage educational multimedia. Theoretical considerations played a major role in shaping the design of the Studio curriculum. Prominent among these were constructionism, situated cognition/situated learning, and self-directed learning. Important related theoretical constructs included scaffolding and flow theory. This paper describes the Studio learning environment, presents these theoretical concepts, and discusses the application of theory to practice in the training of adults in instructional design and development (IDD).

Keywords Constructionism · Constructivism · Situated cognition · Situated learning · Self-directed learning · Scaffolding · Instructional design · Peer mentoring

In graduate programs at universities around the United States, the one-course/one-instructor model has long been the standard. This model has many strengths, but it also places limitations on the authenticity of instruction for the professional contexts of many

Beginning in the fall of 2009, when this manuscript was still in review, the Studio program was relocated to the Gwinnett branch campus of the University of Georgia in order to better serve the Atlanta professional community. This relocation has occasioned some changes in the curriculum that are still being worked out and have not been documented in this manuscript. The Studio continues to evolve in response to the needs of students.

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disciplines for which students are preparing. Students can end up poorly prepared to participate in the ill-structured consultant-client relationships or communities of practice found in many professional contexts when an instructor excessively structures their graduate education in a top-down fashion. The purpose of this article is to discuss a unique form of graduate education in instructional technology[1] at a large, research-extensive university in the southeastern United States, called simply the Studio, where students are enrolled in multiple courses involving several faculty and all collaborate over an extended period of time (three 16-week semesters). The Studio curriculum comprises a very different course organization and structure with roles for students and faculty dissimilar to that found in the one-course/one-instructor model. The Studio model denotes new rules and relationships of power, authority, and responsibility that are intended to be more fair and equitable; as such, the Studio curriculum is an imperfect embodiment of underlying ideals. These ideals include the epistemological beliefs and principles of constructivism. A decade's worth of experience with the Studio curriculum, including modest amounts of empirical data collected along the way (see "A review of the Studio experience" section below), suggests to us that it is a viable and appropriate approach. We regard it as preferable to the typical alternative—a curriculum in which virtually all of the decisions about what to learn and how are made by an instructor. The Studio curriculum is consistent with Dewey's educational philosophy as set forth in *Democracy and Education*: "A society which is mobile, which is full of channels for the distribution of a change occurring anywhere, must see to it that its members are educated to personal initiative and adaptability" (Dewey 1916, p. 84). This "personal initiative and adaptability" is, in a real sense, what the Studio experience is all about.

In this paper we describe the Studio curriculum and discuss the theoretical and philosophical principles upon which the Studio curriculum is based. We also provide a critique of the Studio's 10-year implementation based on a review of research efforts, student evaluations, and student comments collected en route, in combination with instructor reflections.

An overview of the Studio curriculum

The Studio curriculum consists of three successive course sections that meet together in the same overall learning space and are taught by a team of instructors. These courses are embedded within the larger master's instructional design and development (IDD) curriculum and students move in and out of the Studio at different points in their program of study. However, the general trajectory of the Studio course sequence mirrors the direction of the wider curriculum, leading toward advanced skill application, authentic experiences, and increased student autonomy. The first Studio course focuses on multimedia tool learning and principles of design; the second focuses on serving an external client in an individual instructional multimedia project; and the third course focuses on a major team IDD project experience serving an external client. The Studio curriculum comprises a total of 12 credits within a standard 36 credit-hour master's curriculum. Each Studio course carries four graduate credits, including one credit for lab work.

[1] Faculty of the this instructional technology graduate program recently changed the official program name to Learning, Design, and Technology, a name which the authors believe to be entirely consistent with the philosophy of the Studio; however, because the Studio has operated under the familiar Instructional Technology banner for most of its ten-year history, the term "instructional technology" will be used in this paper to refer to both the graduate degree program and the broader field in which it resides.

The structure of the Studio curriculum is summarized and illustrated in Figs. 1 and 2 and in Table 1. Figure 1 illustrates the sequence of the Studio courses in the context of other required courses in the master's curriculum and emphasizes the intended gradual progression from higher instructor support, lower student autonomy to lower instructor support, higher student autonomy. Figure 2 presents the vertical structure of the Studio curriculum as a single concurrent learning community consisting of three interdependent layers of participation. Table 1 summarizes the requirements for each of the Studio courses along with some of the other important expectations, such as peer mentoring. For a complete description of the curriculum, refer to the 10-year anniversary Studio Handbook (Rieber et al. 2008), available at the Studio web site (http://it.coe.uga.edu/studio/studiohb.pdf).

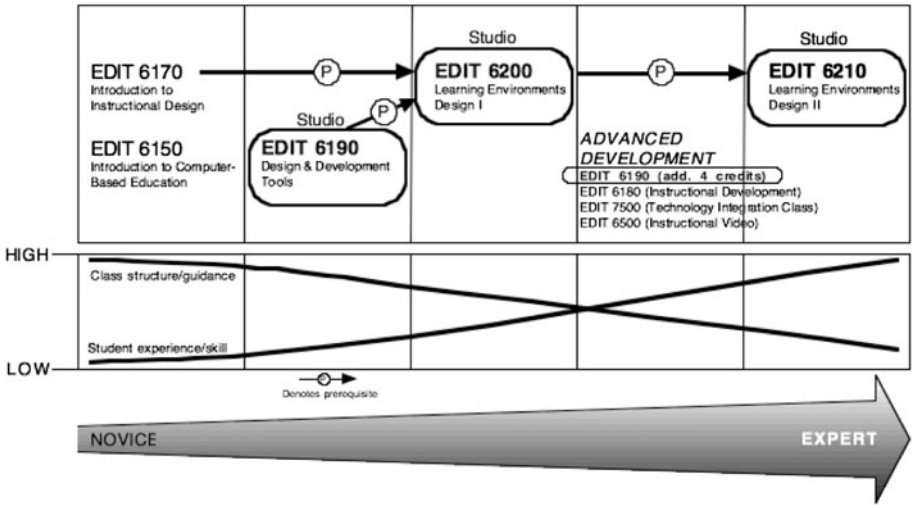

Fig. 1 Sequence and general philosophy of the Studio curriculum (*Notes* The Studio courses are *circled*; EDIT 6190 may be repeated and can fulfill the "advanced development" requirement of the master's curriculum.)

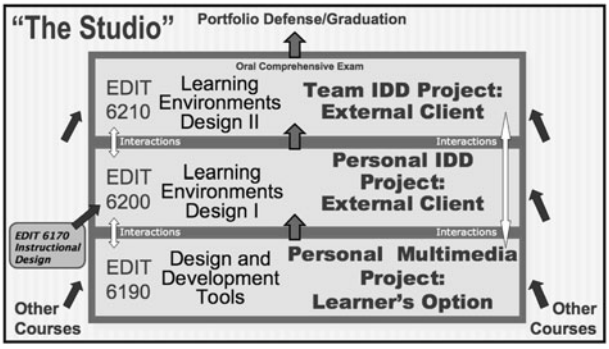

Fig. 2 Vertical structure of the Studio Curriculum (*Notes* Other courses in the overall master's curriculum are viewed as "feeding into" and supporting the Studio courses; EDIT 6170 Introduction to Instructional Design is a course outside of the Studio sequence that is prerequisite to second level Studio course.)

Table 1 Specific participant requirements of each of the Studio courses with relative contribution to final grade

	First course EDIT 6190 design & development tools	Second course EDIT 6200 learning environments Design I	Final course EDIT 6210 learning environments Design II
Participation	15%	15%	15%
Attend all mandatory meetings and activities; Follow all course procedures			
Community service	10%	10%	10%
Provide at least 10 h of service to any non-profit group or agency; the service must relate in some way to instructional technology			
Peer critiques	10%	10%	10%
Write at least 4 constructive critiques of other peers' design work throughout the term			
Individual Multimedia Project	45%	40%	Mentor students in EDIT 6190 and EDIT 6200
	Negotiated with the Studio manager for this course; project based on design principles aligned with constructionism, *not* those of instructional design.	*Scope* One lesson; Project evaluated based on *instructional* design principles consistent with educational multimedia	
Team Multimedia Project	5%	15%	40%
	Attend at least two meetings of EDIT 6210 Project Teams and comment on these in your design journal	Consultant on one EDIT 6210 Team Project providing at least 20 h of consultation	*Scope* One unit; Assume role and responsibilities on one team project in negotiation with other team members and Studio manager for this course; Typical project roles include Project Manager, Instructional Designer, Graphic Designer, Programmer, Evaluator

Table 1 continued

	First course EDIT 6190 design & development tools	Second course EDIT 6200 learning environments Design I	Final course EDIT 6210 learning environments Design II
Comprehensive exam	Prepare for comprehensive exam by reading and discussing assigned course readings and other readings of your choice related to all aspects of instructional technology (theory, research, and practice)		Oral exam If performance is not satisfactory, the oral exam is repeated after given feedback; if second oral is not satisfactory, a written paper on assigned literature is required (*Note* No percentage of contribution is provided because this requirement is considered a general requirement of the master's degree.)
Writing activities	15% Maintain a design journal while completing project; integrate design literature within journal entries	10% Individual project documentation and formative evaluation report	25% Team Project Documentation (examples include needs assessment, performance objectives, treatment rationale and description, formative evaluation report, client sign-off forms)

The remaining courses in the master's curriculum are three credits each. Other required courses are typical of a master's curriculum in instructional technology and include topics such as instructional design, learning theory, project management, and educational research methods. These other required courses are taught using the one-course/one-instructor model. Electives, comprising nine graduate credits, are typically taken in topics such as advanced instructional design, video production, and adult learning theory. Table 1 provides the relative contribution of each requirement to the final course grade of Studio participants. Those familiar with constructivist perspectives on education understand that there is a tension or even contradiction between this philosophy and any judgment of a learner's performance. This issue will be addressed throughout this paper, but it is an example of the compromises that must be made between trying to work within a constructivist learning environment and teaching in a formal educational system such as a university.

The originators of the Studio curriculum—Lloyd Rieber, Michael Orey, and James King—envisioned the learning of educational multimedia design to be patterned after that of an art or architectural studio (Tripp 1994) in which a group of people learn skills and develop expertise while working on authentic projects in a public space comprised of tools and work areas.

The Studio curriculum comprises a sequence of three courses that we will refer to as the first course, second course, and final course, respectively. While such a structure and progression is common to most universities that have instructional technology programs, what is unique here is that students and faculty in all three courses meet and work together throughout the semester. A typical Studio class begins with all participants meeting in one room to review the evening's activities, discuss a design theme or issue, or review the progress of the final course's design teams. As students go to various activities and events, many of them organized by the participants themselves, they meet, help, and interact with a variety of their classmates. The more experienced and skilled Studio participants are expected to mentor those with less experience and skill. Of course, all participants have unique responsibilities associated with their respective course, but all have opportunities to call on any of the instructors and other participants for help, advice, and critiques as project development proceeds during the semester. This all-in-one structure helps to make transparent the requirements and dynamics of the more advanced courses for all participants from the very beginning of the Studio experience. This structure also helps to legitimize established aspects of the Studio culture, such as the community service requirement (see Table 1); each new group of students sees these in operation among their more seasoned peers. The culture of the Studio is evidenced by the fact that when participants are asked about their graduate load in a semester, they typically respond first by stating they are "in the Studio" and second by naming a particular Studio course.

Imposed structure on participants diminishes progressively while they complete the three courses in the Studio curriculum. For the portion of the curriculum that is specific to the first course, the instructor prepares a weekly agenda, readings, discussions, and workshops for the most typical tools chosen by participants. In the context of the second course, the instructor organizes weekly design discussions and organizes a schedule of project design documents and other project deliverables. For participation at the final course level, the participants are expected to organize themselves into teams that are then responsible to organize their weekly meetings and semester schedule for developing their team project. In all three courses, the second half of the semester is characterized less by any explicit course structure and more by work on the respective Studio projects. At the end of the semester, all of the participants show their projects in a public forum called the Showcase at which the public and professional community are invited to attend. Similar to

an athlete or musician who willingly spends countless hours practicing basic skills in order to be able to complete in the "big game" or performance (Anderson et al. 1996), students find that the showcase provides an authentic and motivating context and rationale for devoting the necessary time it actually takes to design and develop a multimedia project.

The goal of the first course is to learn broadly about the nature of design while acquiring proficiency with multimedia tools. Participants can choose any project topic they wish and there is no expectation that the project will be instructional in nature. Indeed, participants are encouraged to choose a topic they are passionate about and committed to completing, one that will more likely be characterized by a degree of the "flow" experience (Csikszentmihalyi 1990). Although workshops are provided on key introductory aspects of the prominent multimedia tools, and assistance from instructors and more skilled participants is provided throughout the semester, participants are largely responsible to set and maintain an independent learning plan for learning the tools sufficiently. They keep a design journal in which they reflect on the design of their project in light of the design literature they read during the semester. Readings for the first course have evolved over the years but have always included selections from Terry Winograd's *Bringing Design to Software* (1996). Examples of other readings include selections from Lawson (1980), Kafai and Resnick (1996), Rose and Meyer (2002), and the entire graphic design book *Design Basics Index* (Krause 2004). While enrolled in the first course, students are responsible for observing at least two final course team project meetings and submitting notes from their observations. Students finish the course having explored and reflected upon principles of design, designed a personally relevant project, acquired a level of technical proficiency in a range of multimedia tools, and caught a glimpse of their future in the form of observing senior Studio participants doing team projects.

Before proceeding to the second course, students must not only complete the first Studio course but must also complete the program's introductory course in instructional design. The instructional design course is taught separately from the Studio sequence out of pragmatic considerations; chief among these is the need to allow students to focus exclusively on learning this set of skills apart from the broader responsibilities associated with being a part of the Studio community. The separate, one-course/one-instructor instructional design course also allows flexibility in accommodating the instructional styles of various faculty members who may teach the course. However, all participating instructors implement the instructional design course using team-based projects, which helps to prepare students for the advanced project work that will be encountered in the final course of the Studio. Participants are thus expected to begin the second Studio course with a firm understanding of instructional design and some experiential knowledge of working in teams, along with their growing multimedia design and development skills.

The goal of the second course is to design a multimedia lesson for an external client, following a general project framework similar to that provided by Allessi and Trollip (2001), which normally serves as the required text. In addition, participants perform 20 "billable" hours of consultation on one of the final course's team projects. The second course is the appropriate stage for this consultant role to be performed since by this point students have acquired some understanding of instructional design as well as team dynamics. Through this consultant role, they also learn more about the elements and dynamics of an advanced team project, building on their prior understanding derived from the observations they performed in the first course as well as their instructional design team experience. A brief orientation to this consulting role is provided by one or more of the Studio instructors. Duties for consultants are limited to supporting tasks rather than primary tasks; otherwise they are defined by the team receiving their services and may include

aspects of virtually any phase of the project. Copy editing, incidental graphic development, usability feedback, programming or authoring support are typical examples of work performed by consultants. These second-course students are counseled to note examples of good and bad team practices in order to be prepared for their own role as team members in the final course in a subsequent semester.

The goal of the final course is to design, in a team setting, a multimedia unit consisting of approximately 3–5 lessons for an external client. By the time participants reach the final course they have developed a wide array of skills and experiences from their prior experience in the Studio and from other courses in the master's curriculum (e.g., project management). Participants are also expected to come to the final course knowing more about their own strengths, weaknesses, and ambitions. For example, an important decision for each team is choosing one project manager. Teams also need to identify who will take the lead on the project's design, development, and evaluation aspects. All teams have to work well with the consultants, that is, with students enrolled in the second course. The 20 hours of consultant work that each second course participant brings must be managed as carefully and strategically as possible. All students in the final course are expected to provide informal mentorship and leadership to other Studio participants, drawing legitimacy from their status as experienced Studio citizens as well as from the work they present as a team. The value of peer mentoring among graduate students is supported in mentoring literature (e.g., Allen et al. 1999; Grant-Vallone and Ensher 2000) as well as in the concept of communities of practice (Lave and Wenger 1991). Discussions of this role are typically held during various meetings with students in the final course. Their team projects are held up as models for all participants, and they are expected to share the progress of their project throughout the semester to the entire Studio community.

In keeping with university requirements, each Studio course has its own instructor of record; however, the teaching model in the Studio is essentially that of team teaching. Each instructor of record is the primary facilitator of instruction for the students in his or her course and carries the usual responsibility for assessment and submission of grades. However, a substantial amount of instructional activity is shared among the instructional team and may be delivered in full-group sessions. Often the team includes not only the three primary instructors but also one or two other faculty or graduate assistants who may have occasion to participate in a co-teaching or support capacity. Typically, the instructors hold a weekly meeting to prepare for that week's class as well as to plan for activities scheduled for later in the term. For example, one major activity that must be planned anew each semester is a series of non-mandatory special interest group or SIG meetings that focus on current topics of interest in instructional multimedia. These informational meetings often feature guest speakers. Recent SIG topics include graphic design, gaming, virtual worlds, and IDD in the workplace.

Assessment in the Studio at all course levels is based primarily on performance rather than knowledge, and is specifically tied to the major project for each course. While instructors are free to adjust their approach to assessment according to preference, each course level presents its list of requirements and deliverables (see Table 1). However, there are two important instances of assessment in the Studio program that are variations of this performance-based theme. First, goals for the final project in the first course are articulated by the student, within very broad limits (these goals are required to be in place by about the midpoint of the semester). Consequently, assessment of the project is based not on a rubric created by the instructor but on the degree to which the student has fulfilled his or her own goals. Second, on the other end of the philosophical spectrum, a brief culminating oral exam is embedded in the final course. This 30-min session, normally conducted by the

instructor of the final course along with a volunteer doctoral student, focuses on a student's knowledge and understanding of instructional technology literature. Though the exam session is brief, students must be prepared to discuss any of a number of seminal issues of the field in areas such as foundations, instructional design, learning theory, and professional practice. This knowledge-based exam is assessed on a pass/not yet pass basis, and thus it can be repeated if needed. The knowledge exam is separate from the final oral portfolio defense, which is a one-hour event scheduled during a student's graduating semester and moderated by a three-member faculty committee. While Studio projects figure prominently in these student electronic portfolios, their scope goes beyond the Studio and the defense is regarded as outside of the Studio structure.

Dominant theoretical constructs behind the Studio curriculum

What is the theoretical justification for such a curriculum structure? Admittedly, the initial Studio curriculum was based largely on the combined experience of the founding Studio instructors when it was first implemented in August, 1998. However, this experience was influenced by the professional literature related to learning and design, and the Studio curriculum was intentionally based on these principles.

A key idea from the beginning was to create a learning experience for instructional designers that would have some degree of analogy to that of an art or architectural studio (Tripp 1994). The instructors viewed studio-based learning as having many desirable qualities, including an emphasis on reflection, major design projects, intensive discussion, and leadership from a master craft-person (Boyer and Mitgang 1996). Variations of studio-based learning have been adopted in a variety of professional contexts, from art education (Michael 1980) and architecture (Dutton 1987) to computer science (Pargas and Weaver 2005), engineering (Turbak and Berg 2002), and teacher education (Burroughs et al. 2009). However, the founding designers of this Studio curriculum were less interested in specific studio-based learning models than in using the general metaphor of a studio as a vehicle for implementing constructivist and constructionist learning experiences. Moreover, one notorious element of art studios—merciless public critiques of student work (Barrett 2000)—was considered incompatible with the ideals being pursued and would be avoided.

The following three theoretical perspectives were expressly identified by the founding Studio instructors as being foundational to the curriculum they were attempting to create: constructionism; situated cognition/situated learning; and self-directed learning (Rieber 2000; Orey et al. 2000; Rieber et al. 2008). Related concepts that also figure prominently in Studio materials include scaffolding and flow theory. Ironically, while the above perspectives may represent a constructivist core underlying the curriculum, the set of skills being taught—IDD—is thoroughly rooted in behaviorism (Dick 1995). A review of these behaviorist roots is, however, beyond the scope of this paper. The following sections will therefore discuss the major perspectives mentioned above and related concepts, along with their application in the Studio: constructionism; situated cognition and situated learning; and self-directed learning.

Constructionism

Two clarifications are needed at the outset regarding the term *constructionism*. First, in the sense discussed here, it should not be confused with the philosophical orientation known as social constructionism (also called simply constructionism). Social constructionism is an

epistemological position (a belief about the nature of knowing) that, put simply, espouses the socio-cultural nature of all knowledge (Crotty 1998). While constructionism, as discussed here, has a strong epistemological dimension (Papert 1991), it is not an epistemology per se but "a theory of learning and a strategy for education" (Kafai and Resnick 1996, p. 1). Second, constructionism (with an "n"), as used in this paper, is regarded as an application of principles of constructivism (with a "v"), which is a variant of social constructionism that emphasizes the construction of knowledge through interaction with the environment.

Constructivism draws heavily on the work of Piaget and Vygotsky and includes the key concepts of social learning, the zone of proximal development, cognitive apprenticeship, and mediated learning (scaffolding). In practice, instruction carried out from a constructivist perspective may emphasize approaches such as cooperative learning, discovery learning, self-directed learning, and the teaching of problem-solving strategies and critical thinking skills (Slavin 2003). Constructivism may be regarded as the form of social constructionism that educators tend to be familiar with. All of these perspectives are to be contrasted with objectivism, the belief that reality is external to the knower and that meaning corresponds to objects and categories in the real world. (See Jonassen 1991, for a comparison of the assumptions of constructivism and objectivism.)

Constructionism, as used here, is a theory of instruction introduced by Seymour Papert and first articulated formally in Harel and Papert (1991), though the roots of constructionism were contained in Papert's seminal work *Mindstorms* (1980). These ideas grew out of his work with psychologist and epistemologist Jean Piaget. Constructionism seeks to promote the internal activity of constructing knowledge through the external activity of constructing a representation or manipulation of that knowledge. Constructionist learning environments are therefore those environments that facilitate such activities with the construction of new knowledge specifically in mind. Though Papert himself has expressed hesitation to describe constructionism in any sort of formulaic manner (Papert 1991), at least four basic tenets of constructionism have been offered by Bers et al. (2002): "(a) learning by designing meaningful projects to share in the community, (b) using concrete objects to build and explore the world, (c) the identification of powerful ideas that are both personally and epistemologically significant, and (d) the importance of self-reflection as part of the learning process" (p. 123).

Students in constructionist learning environments are engaged in the designing of many kinds of things in a social setting, as explained by Kafai and Resnick (1996):

> Constructionism suggests that learners are particularly likely to make new ideas when they are actively engaged in making some type of external artifact—be it a robot, a poem, a sand castle, or a computer program—which they can reflect upon and share with others. (p. 1)

More detailed descriptions of applications of constructionism may be found in Harel and Papert (1991), Kafai and Resnick (1996), and Rieber (2003).

Constructionism is therefore a good fit for the training of adults in IDD, in which a public artifact is normally produced. Given the nature of IDD as a design activity (Nelson and Stolterman 2003; Tripp 1994), constructionism, the essence of which is learning-by-designing, provides a framework for maximizing learning.

Constructionism applied in the Studio

In the first Studio course, participants create a project that is continually open to review and critique by other members of the Studio community. Additionally, they complete a web-

based, public design journal during the design and development phases of the project. Finally, Studio participants in all three courses show and discuss their respective Studio projects at the "Studio showcase," the final and culminating event that is open to the general professional community.

It is crucial that participants choose a project topic in the first course about which they are passionate. In keeping with this constructionist emphasis, they are explicitly advised to reflect on their values and interests and to choose a topic for which they are highly enthusiastic and devoted. This is posed as a unique opportunity for the students, that is, to receive graduate credit for pursuing one of their passions. Consequently, topics range from the very personal (e.g. documenting the birth of a child or an important anniversary of parents) to avocations (e.g. gardening, quilting, traveling). Work-related project topics are not off limits, but participants are counseled not to choose a project that will seem like "work."

It is explicitly hoped that students who follow this advice will experience the kind of optimal life experience that Csikszentmihalyi (1990) identified as "flow" during the completion of their projects. Csikszentmihalyi originally defined flow as "…the state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (p. 4). Flow is associated with losing track of time, a sense of momentum, and often a sense of creative productivity (Csikszentmihalyi 1996). Early in the semester, students are presented with information about flow theory and encouraged to look for this experience in their design and development process. It may seem overly ambitious to expect graduate students to regard a component of their required coursework in this fashion; however, Studio participants who have been interviewed as part of several research projects have in fact reported, without exception, episodes of flow in their project work, in many cases losing track of time repeatedly, for several hours at a stretch (Clinton 2005, 2007; Clinton and Rieber 2005).

The implementation of any model for learning tends to be an imperfect approximation of an ideal, and the Studio curriculum is no exception. However, the first course, with its emphasis on tool and design learning rather than on creating instruction, lends itself well to the constructionist approach described above. It is the most overtly constructionist of the three Studio courses, having an ample measure of all the learner-centered elements identified by Bers et al. (2002)—the sharing of a meaningful design process, the exploration of meaning through the building of artifacts, the personally powerful ideas, and self-reflection as an integral part of the design experience. Thus the first course sets the tone for the entire Studio experience, and students are expected to put this way of learning to use in the rest of the program.

Creating instructional products for real clients is a highly valued aspect of the program, and the remaining two courses include this authentic aspect. They also require a formal instructional design process. The second and final courses therefore introduce constraints on what projects students may choose and how these projects must be carried out. However, the sources of the constraints—the authenticity of working with a client and the professional responsibility of making instructional design work—provide an alternative form of personal meaning for the student. In this sense, the "personally significant ideas" of constructionism (Bers et al. 2002) are embodied in the students' grappling with their identity as a professional as they carry out real-life professional tasks. Moreover, in the second and final course students still experience the shared elements of the Studio, including peer critiquing of projects, public reflective writing, and the public Showcase of projects. The constructionist ideal of learning via the design and creation of personally

meaningful artifacts that are shared with one's peers in a self-managed, self-reflective process is thus maintained throughout the program.

Situated cognition and situated learning

After constructivism, the next most important theoretical construct influencing the Studio curriculum has been situated cognition. A seminal article advocating for situated cognition was Brown et al. (1989. Major concepts in this article included situated cognition, cognitive apprenticeship, scaffolding, communities of practice, legitimate peripheral participation (situated learning), and enculturation. Brown, Collins, and Duguid heavily cited the work of Jean Lave (see the discussion of situated learning below).

Situated cognition posits that all thinking, learning, and knowledge arise from socially mediated activities embedded in authentic and meaningful contexts. Specifically, situated cognition refers to the embedding of a given learning activity within a context that is authentic to the context from which the content is derived. For example, Brown et al. (1989 discussed successful models of cognitive apprenticeship in which classroom instruction was presented by teachers modeling the reasoning processes of mathematics professionals rather than those of typical math teachers. Cognitive apprenticeship is also dependent on the concept of the zone of proximal development (Vygotsky 1978; see the discussion of scaffolding below).

Situated learning may be viewed as one kind of situated cognition. Also called legitimate peripheral participation, it is a descriptive theory that offers a comprehensive view of the way learning is socially situated in communities of practice. The theory broadens the idea of apprenticeship into an "an integral part of generative social practice in the lived-in world" (Lave and Wenger 1991, p. 35). In this view, learning is first and foremost a process of social participation, and secondarily a process of acquiring knowledge or skills. Legitimate peripheral participation is thus a process of gradual enculturation into a community of practice, of moving from newcomer status to experienced participant status. The term 'peripheral' is meant therefore to be directional; however, the 'center' of practice is not defined; rather, learners are moving toward "full participation." From this kind of perspective, even solo learning may be regarded as covertly social (Salomon and Perkins 1998) and may be part of learners' peripheral participation in a practicing community. (See also Dewey's exposition of the educative nature of social interaction, Dewey 1916.)

Scaffolding, a construct closely related to situated cognition and situated learning, is generally credited to Jerome Bruner and colleagues in the 1970s (Wood et al. 1976). Scaffolding is closely related to Vygotsky's (1978) concepts of the zone of proximal development (ZPD) and the more knowledgeable other (MKO). According to these concepts, the best learning happens in the area just beyond what the learner is capable of on his or her own; a person with more knowledge can provide the necessary assistance for this learning.

Bruner's variation on this theme focused on the issue of support. As the metaphor from building construction suggests, scaffolding describes support for learning that is gradually removed, or faded, over time. Fading is an integral component in scaffolding (Pea 2004), which is commonly applied in individual teacher-learner interactions but may also logically be built into the overall design of an academic program.

Situated cognition and situated learning applied in the Studio

A key example of situated cognition in the Studio is the legitimate peripheral participation experienced by each student over the life of the program. While many graduate programs

exhibit elements of legitimate peripheral participation, the Studio curriculum makes this explicit by creating a specific and highly valued community of practice within the larger master's program, one in which the progression from newcomer to experienced citizen is made transparent to students from the beginning. Not only is this process outlined in the Studio Handbook, which serves as the "constitution" for the entire program and is read by all students; it also unfolds with each semester in a new cycle before the eyes of every student.

Lave and Wenger (1991) cautioned that the center of practice remains undefined in their model. Indeed, one would not want to overstate the 'centrality' of the final course project teams within the Studio community; the "full participation" described by Lave and Wenger (1991) can take other forms—notably in those students in the first two courses who take ownership of the community aspect of the experience and are seen as "going the extra mile" when helping others. Also, the presence of external experts from the field is an essential element in situated learning; guest speakers from various professional contexts help to connect Studio participants with the wider professional community, of which the Studio is definitely *not* the center. The ultimate goal of the Studio is to help participants move toward full participation in this wider community. Nonetheless, the final course is the culminating course of the Studio program. The team project experience is clearly identified from the outset as the target experience for which participants should be preparing as they work through the earlier stages of the program. Students enrolled in the first course listen to various presentations delivered by the project teams to the community and are required to sit in on several of the team meetings, submitting notes as evidence of their participation. When they move into the second course, they are drawn more deeply into the team experience by serving actively in the role of consultant. In this way, the structure of the Studio curriculum and the interactions between the different course levels allow each student to move steadily toward full participation in the Studio community.

The principle of scaffolding, in the context of situated cognition, is a particularly important component in the Studio's design. The overall "scaffold" of support fades slowly over the three-course sequence. It is strongest in the first course, but even here students are expected to make decisions about their learning path, with help and advice from the instructor. In comparison to a traditional graduate course, participants in the first course have much latitude, but not nearly as much as they have in the second course, nor, especially, in the final course.

In addition to the broad structure of the curriculum, a good example of scaffolding can be found in the first Studio course. Here students begin to learn a variety of multimedia tools in order to develop initial skills for use throughout their Studio and master's experience. Students are not all compelled to learn the same tools, but instead each submits a contract for his or her tool learning at the start of the semester. The instructor provides several sample contracts from which most students build their own personalized contract. Each contract includes a description of the skills to be acquired and also the resources that will be used to learn the tool, the most typical of which is a "how to" textbook. The instructional team also conducts a series of workshops on the most common tools, but it is made explicit that these are meant as merely an introduction to the tool and are not meant as a substitute for serious self-directed study on the part of the student. At mid-semester, each student meets one-on-one with the instructor to conduct an individualized "performance review." The student demonstrates his or her understanding of the contracted tools to the satisfaction of the instructor by completing various tasks on demand, that is, on the computer with the tools up and running in the presence of the instructor. The purpose of this performance review is to ensure that students have made progress in their skill

building. The performance review is obviously a cause of some concern by students during the first part of the term, which helps to motivate them. Those who do not perform as well as they should are given clear formative feedback on what work needs to be done in the short-term, and a follow-up review is scheduled for a few weeks later. This contractual approach within the context of the highly personalized performance review gives students enough structure to help them acquire sufficient proficiency to complete a project while also following a learning model based on self-direction. These scaffolds are deliberately faded in the second half of the semester. Studio participants have generally shown that they can effectively continue to enhance their tool skills, as well as develop new skills, in their remaining Studio courses following this scaffolded process.

The fading element of scaffolding is also evident in the level of support given to project teams in the final course. Given that the culminating learning activity of the program is very intensive, the instructor for the final course is faced with the challenge from week to week of deciding how much active support to provide. Group sessions are needed at the beginning of the semester to clarify the task at hand for students, facilitate team formation if needed, present due dates and documentation requirements, and review key concepts such as elements of teamwork and the importance of good performance objectives. However, with the volume of work that teams must manage from week to week, it becomes evident very early in the semester that the teams need to be pulled away from their work as little as possible. Students who have passed through the program up to this point should, in theory, be well equipped to tackle the final team project for an external client. Specifically for this course, then, instructional sessions should be scheduled only in response to a clear need. In practice, the needs of the teams vary from semester to semester depending on students' collective levels of experience and skill. Needed areas of additional instructional support have included, for example, task analysis and prototyping strategies.

Self-directed learning

The third major theoretical construct associated with the Studio is that of self-directed learning. In contrast to self-regulated learning, which refers to well-defined behavioral strategies for reaching short-term learning goals, self-directed learning is a broad constructivist perspective that refers to a learner deciding what to learn and how to learn it, what end-product will suffice as evidence of the learning, and when this goal has been reached (Moran 2005). Self-directed learning, with its longer-term focus, has also been called simply a way of life (Brockett and Hiemstra 1991). It is often illustrated with examples of adults who become interested in a particular topic or activity outside of formal education and who take the initiative to make learning happen in that topic.

The concept of self-directed learning has been enormously influential in adult education. By the early 1980s, self-directed learning had become "the chief growth area in the field of adult education research" (Brookfield 1984, p. 59). Candy (1991) attributed the modern origins of self-directed learning research to the work of Cyril Houle and Allen Tough in the 1960s. However, the processes and conditions of self-directed learning have existed as a major force in human life since ancient times (Brockett and Hiemstra 1991).

Building on the work of Brockett and Hiemstra (1991), Candy (1991) identified two categories of self-directed learning, each with two subcategories. The first category is the learner's activity or method of self-directed learning, which may be divided into true autodidaxy (self-education, with no reference to an instructor) and assisted autodidaxy,

also called independent study, in which an instructor still maintains some degree of control. The second category is the goal of learner self-direction, which is divided into the learner's capacity for self-management (similar to self-regulated learning) and the learner's personal autonomy in the sense of choosing one's direction in learning (Candy 1991).

As an approach to instruction, SDL presents an apparent paradox: self-direction implies learning without the aid of an instructor or facilitator. However, those who work with adult learners can do many things to help promote SDL in their learners, including assisting with planning, providing feedback, and locating or coordinating available resources (Brockett and Hiemstra 1991).

Self-directed learning applied in the Studio

In the first Studio course, seminars and discussions are held specifically to address the nature of self-directed learning. These become very personal in the sense that participants are asked to tell stories of self-directed learning in everyday life. A main point of these discussions is that, as adults, everyone has had countless self-directed learning experiences because that is how most of the important lessons of life are learned. Something seems to happen, however, when one crosses the threshold of school—one takes on the persona of a student, a persona learned over a period of at least 16 years of formal schooling. This persona is usually accompanied by feelings of needing or wanting complete direction and control by the instructor. If direction is not provided, discomfort and frustration often follow, usually because the concept of self-directed-ness is interpreted as "I need to learn this all by myself without help." Indeed, in the Studio there tends to be an expectation that the instructors will be able show step-by-step and in a fixed sequence how to use a multitude of multimedia tools and apply design principles in such a way that all participants will be able to create exemplary projects (Fiedler 1999; Song and Hill 2004; Clinton 2007). There is an assumption that there is one "best way" to learn these skills suitable for all learners. But, like many important life skills, these multimedia skills are multi-faceted, complex, ill-structured, and determined in large part by the nature and context of the design problem or project. The seminars and discussions about self-directed learning help to reveal the incompatibility and incongruence of the desire for a simple directed learning experience within a complex learning and working context, such as that of designing a multimedia project.

As the first course unfolds, participants begin to see that self-directed learning is not about "going it alone," but instead is about making choices and decisions, followed by taking action. Some actions include going to organized workshops that present a subset of skills in a structured way. Other actions include making appointments with instructors or more capable peers for individual tutoring or help. Also, since the level of student autonomy increases from one semester to the next, the level of self-directed learning also increases as one progresses through the Studio classes. Slowly most participants seem to realize, sometimes only over the duration of the three courses, that the diversity of the people and needs dictated by the projects results in a similar diversity of learning paths and that no instructor could possibly organize any "best route" that would meet all the competing needs and expectations. Most students appear to leave the graduate program comfortable with a learning approach that will serve them well as a practicing professional (Clinton 2007; Lee 2009). Even in the case of those for whom the self-direction required in the Studio does not work well, at least they have experienced a different model for how "school" might be conducted.

A review of the Studio experience: 10 years of implementation

The Studio curriculum was designed to embody, if possible, the most contemporary theoretical constructs touted by scholars in the field of instructional technology. We have tried to put theory into practice. If scholars advocate that these theories of learning and instruction should be adopted and implemented by educators and trainers in their respective professional settings, then surely these same theories should be able to guide graduate education within the instructional technology field itself. The effectiveness of the Studio curriculum should be as robust as the theories themselves, given the assumption that the theories have been implemented with reasonably high fidelity. However, it is fair to ask what evidence exists to support the legitimacy of the Studio curriculum as an approach to graduate education within the field of instructional technology. Of course, it is equally fair to ask what evidence supports the legitimacy of the one-course/one-instructor model, beyond the fact that it has been in place for so long. Like any teaching experience, the decisions related to curriculum scope and pedagogy are best viewed as resting on a combination of information, rationales, and skills available to the instructors. All are situated within the culture of the educational environment in which they are made.

As is customary for university instructors, we have sought continual feedback from our students in combination with an evaluation of their performance. Student feedback has come from a variety of sources, such as instructor-prepared student evaluations and student debriefing sessions (individual and group). Other student feedback has been obtained in unsolicited ways from students who took the initiative to send feedback on their own (see Table 3). Finally, feedback has also come, along with other kinds of data, from research projects conducted within the Studio learning environment. Data derived from these sources have been the basis of changes to the Studio's design over time.

Research informing the Studio program

Data from formal and informal research efforts have helped to inform program decisions and enrich the experience of students in the Studio program. A total of seven formal and two informal research efforts on the Studio program have been conducted and written up thus far in its 10-year history. Much of this work has been concerned chiefly with student feedback on the quality of their experience, offering positives and negatives and suggestions for change (e.g., Fiedler 1999; Orey et al. 2000; Song and Hill 2004). More recently, studies conducted in the Studio environment have been dissertation projects focused on the Studio as a community of practice (Holschuh 2006), on the role of creativity in the design and development experience of students (Clinton 2007), on the Studio as a community of shared innovation (West 2009a) and on student beliefs about teaching and learning in relation to student-centered learning environments (Lee 2009). While little of this material has been published in peer reviewed journals as of this writing (but see West 2009b), the data presented in them has nonetheless been of great interest to Studio instructors, especially when the findings include information germane to program evaluation. Table 2 presents a tabulation of a selection of these studies, giving their basic characteristics along with program evaluation highlights from their findings. One of the informal studies was the initial program evaluation effort by instructors and these results are included here; the other informal study (Fiedler 1999), two pilot studies (Clinton and Rieber 2005; Clinton 2005), and one of the dissertations that did not contribute significantly to program evaluation (West 2009a), have been omitted for space considerations.

Table 2 Studies conducted in the Studio learning environment

Orey et al. (2000)	
Focus	Student feedback
Research questions or purpose	"The focus of this project is on implementing a constructivist approach within the context of our graduate program. Part of the implementation is to determine how the implementation is working for the students" (no page #).
Methodology	Qualitative collection of student feedback via online discussion threads (including option to post anonymously). Questions asked in the fall semester of the first year: "1. What has worked well in regard to The Studio so far? 2. What has not worked well in regard to The Studio so far? 3. What would be the best way to get data from you, the students, so that you can express your ideas and feelings without fear of retribution? 4. In an ideal world, what would be your top 5 things that you would want as part of The Studio? 5. What do you think about a physical space for The Studio? What would be in it? Would it have network drops so that you could bring your own computer into the network as well as University supplied machines? What resources would it have? Would you want to be able to have a place where you could keep your books, papers, etc.? Would you want to have a refrigerator? What else? 6. Do you feel that the structure for The Studio is about right, not enough, or too much? How would you like to see it changed? 7. What about class meetings, seminars and workshops? Should there be required meetings? Should there be required workshops and seminars? What other kinds of meetings do you think there ought to be? 8. What should be added, deleted, or kept with regard to WebCT? 9. Are there other telecommunication tools that we ought to have in The Studio? 10. Should there be two kinds of possible experiences in The Studio? One would be a residential experience where you have a space assigned to you in The Studio and the other is the virtual experience, where a student could do 95% of their work at home and only participate in The Studio on a virtual basis?" (no page #) Questions asked in the spring semester of the first year (condensed): "1. Give Us Your Anonymous Feedback: You should notice when you click on reply that there is a check box with the words Post Anonymously in front of it. 2. The Studio culture: In our analysis of last semester's studio, we found that the categories of Studio Culture, Communication and Structure accounted for most peoples comments about their experience. Do you think that there is an emerging Studio culture and what is it? What can we do to keep it if you like it and what can we do to change if you do not like it? 3. Communication: The second category to emerge from the data was communication. How have we done with this? We have added specific required classes. We added required desk crits. We added photos to WebCT. Have any of these changes improved communication? What can be done to continue to refine this? 4. Structure: The final category was Structure. Students wanted more structure. We added some. Is it enough? What more can be added? What should not be taken away?" (no page #)

Table 2 continued

Orey et al. (2000)	
Participants	23 Fall semester students and 31 spring semester students from all Studio course levels. "While we do not have the breakdown for students in the spring, the fall's numbers have become typical… 18 were taking the 'Tools' class, 5 were taking Learning Environments Design I, and 5 were taking Learning Environments Design II… Of the 18 Tools students, 12 were female and six were male. Further, eight were primarily learning Authorware, one was learning Director and the rest were learning various tools for designing web pages (FrontPage, Drumbeat, Dreamweaver, Fireworks)…. There were five students in The Studio who were doctoral students seeking careers in academia, 12 students were seeking careers in Government or Business and Industry, and six students are interested in work in K-12 schools" (no page #).
Analysis	Identifying major themes and categories; emerging themes
Program evaluation highlights from findings	Positive feedback and suggestions for improvement fell into three broad categories: (1) The Studio Culture—Students liked having access to more than one instructor; students valued the cross-interaction between course levels; first-course students appreciated the autonomy afforded to them to choose tools they wanted to study and which workshops they would attend; students responded positively to guests brought in from the field. (2) Communication—students called for more face-to-face interaction and specifically asked for more required class sessions; students did not find the (at that time) required WebCT electronic discussion board participation to be very meaningful; students called for a more robust people-database, though there was no general agreement about features to include; the vulnerability of seeking formative project feedback from peers was a major obstacle for some students. (3) Structure—students in the first course wanted more structure and more guidance on choosing what tool to study; second course and final course students did not want more structure; students wanted more specific workshops on their tool(s) of choice; students wanted more objective criteria for grading projects; students didn't like being graded on their online discussion board participation.
Song and Hill (2004)	
Focus	Student perspectives
Research questions or purpose	"The researchers obtained data regarding students' perceptions of their overall learning. … We also sought to gain an understanding of the learners' sense of the learning community, and their suggestions for the instructors and future students of the Studio" (p. 4).
Methodology	Qualitative interview study
Participants	Eight interviewees from all Studio course levels
Analysis	Identifying major themes and categories; emerging themes; peer-check of themes
Program evaluation highlights from findings	Student responses "mostly positive with some challenges" (p. 15); community "overall connected yet separate" (p. 15); recommendations for instructors—more structure, more scaffolding; recommendations for students—actively seek help, expect learning curve, time management, work together

Table 2 continued

Holschuh (2006)	
Focus	The Studio as a community of practice
Research questions or purpose	"1. How do theories of communities of practice explicate the way students engage in and negotiate design of an authentic design project within a team-based context? 2. How is the way in which students conduct design within a team-based context influenced by the design-studio model? 3. How do students come to identity themselves as members of the culture of designers in the design team, in the Studio, and in the larger cultures of instructional and multimedia designers? Where and how is value assigned within this culture?" (p. 6)
Methodology	Micro-ethnography
Participants	Three members of a project team in the third course (in the context of the wider Studio environment)
Analysis	Description, analysis, and interpretation, following Wolcott (1994)
Program evaluation highlights from findings	Aspects of community in the Studio included both designed and emergent aspects; *Recommendations*: increase rigor through instructor-led design critiques; foster the role of peer masters; follow up with students after they leave the program
Clinton (2007)	
Focus	Creativity in student design experience
Research questions or purpose	"(1) What relationships can be found between: (a) self-rating of personal creative ability by program participants; (b) participants' composite scores on the Torrance Tests of Creative Thinking—Figural (TTCT:F); and (c) ratings of participant projects by a panel of experts? (2) What does the design process of individual students look like? (3) What are participants' perceptions of creativity as it relates to their project work?" (p. 81)
Methodology	Mixed method—case studies (interviews, document analysis of design journals), correlational study (creativity assessments, questionnaires)
Participants	Five students from the first course (case studies); 17 students from the first two course levels (correlational study)
Analysis	Qualitative: grounded theory; inductive-deductive interaction (Strauss and Corbin 1990). Quantitative: descriptive statistics (including Pearson's r and Kendall's tau correlations)
Program evaluation highlights from findings	Case studies described students who enter the program having more skills with the multimedia development tools, who tend to view themselves as creative, generally thriving in the program. In contrast, case study participants who lack these initial skills may view themselves as less than creative and generally experience frustration in the program, needing additional support *Recommendations*: 1. Screen incoming students and steer those who lack technology skills to a pre-Studio multimedia tools course. 2. Adapt the service hours requirement for the third level students. Third level students would be required to contribute their 10 service hours to tutoring of other students. 3. Include creativity instruction in the Studio curriculum.

Table 2 continued

Lee (2009)	
Focus	Students' beliefs about teaching and learning in relation to their perceptions of student-centered learning environments
Research questions or purpose	"1. How are students' beliefs about teaching and learning compatible with the expectations of student-centered learning environments? 2. How are students' beliefs about teaching and learning related to their perceptions of the Studio Experience? 3. How do students' learning experiences in the Studio influence the change in their beliefs about teaching and learning?" (p. 14)
Methodology	Case studies (semi-structured interviews, observations, document analysis)
Participants	Five students from the 1st course, two from the 2nd course, four from the 3rd course
Analysis	Inductive qualitative analysis; in vivo coding; comparative method; emerging themes and relationships
Program evaluation highlights from findings	"Students with little background knowledge and skills regarding computer tools were mostly frustrated in this self-directed learning environment…. Those who held constructivist views and high self-efficacy about technology enjoyed learning independently in the courses and confirmed their beliefs. Also, students who had reproductive [epistemological] beliefs and high self-efficacy about technology were able to adapt to the Studio approach and appreciated the new way of teaching and learning. Transformation of students' beliefs about teaching and learning did not occur easily. It occurred when students overcame difficulties and conflicts that challenged their beliefs and abilities and made them frustrated. The more that students were challenged and frustrated, the more possibility there was for them to change their beliefs once they got over the difficulties…. Learning experiences in the Studio allowed students to better understand student-centered learning approaches and students' roles and to increase their confidence about learning in new learning environments. Students appreciated the new approaches and they believed that they became more adaptive to different types of teaching and learning, which is a necessary skill for lifelong learners" (pp. 184–185).

It is beyond the scope of this paper to list all of the findings of the studies in Table 2. All have included both positive and negative feedback from students. All have highlighted the uniqueness of the Studio program among the college experiences of students. While findings pertinent to program evaluation have been highlighted, it is difficult if not impossible to arrive at any general evaluation summary due to the evolving nature of the program. There have been many instances in which negative feedback in one semester has led to positive change in the following semester. For example, the initial program evaluation efforts of instructors (Orey et al. 2000) revealed that students did not find the required discussion board participation to be very meaningful, and did not like being graded on the online discussion board participation. This early effort at participant interaction was subsequently dropped from the program. As another early example from Orey et al. (2000), students called for a more robust people-database. In response, a participant profile system was implemented, providing a simple "people page" that included photos

and project information; this system remained in use for several years. While not all suggested changes have been implemented, various data, some from student performance, some from ongoing student feedback, and some from specific research, have led to other specific adjustments in the program. These are discussed in the following sections.

Program effectiveness in relation to student background in multimedia skills

Perhaps the most salient finding in Table 2 is found in Clinton (2007) and Lee (2009); both concluded that the more lacking a student is in background with multimedia tools, the more likely that student will be frustrated in the Studio. This finding from two different dissertations is consistent with the experience of the authors in their role as Studio instructors. Put a different way, the Studio curriculum is best suited to those who bring some background knowledge of multimedia development into the program with them. It appears that the main strength of the program, then, is to provide an avenue for people with at least some limited technical experience to add the knowledge and experience of designing instruction to their technical ability and to expand their technical skills at the same time.

This is not to say that those who have lacked this background tend to drop out of the program—on the contrary, the great majority of students who enroll in the program go onto graduate, including students having a wide range of technical and academic ability. Still, it appears that some students have simply needed more support, particularly in the first course, and not all of those calling for more support have been lacking in effort. The issue is partly one of placement—which students should enroll in the Studio—and partly of support—how can students weak in multimedia background be better scaffolded in the Studio?

Regarding placement, an introductory multimedia tools class had been the intended solution; students were urged via instructor email to enroll in the introductory class first, if needed. However, the choice was still left up to students and very few IDD students chose to take the course for remedial purposes. Students tended to jump into a very challenging learning environment rather than take an extra, non-required class just to be better prepared. Steps are being taken at the time of this writing to re-purpose the pre-Studio multimedia course and to include it as part of the required curriculum for all students (with adaptations for those with more advanced skills). Finally, regarding support, the findings of Clinton (2007) led to changes in the mentoring structure described in the Peer Mentoring section below.

Quality of student projects

We are not prepared to claim that student projects created in the Studio environment are superior to projects created in the one-course/one-instructor model. However, instructor evaluation data indicates that the great majority of projects submitted have met the evaluation criteria specified at the start of the semester. One significant difference the instructors have noted is that in the Studio there are community expectations as well as instructor expectations. Because participants continually see and review the projects of their peers, the expectation for higher quality projects has naturally been raised among the participants themselves. Peer critiquing of projects reaches its conclusion each semester with a peer-led award for excellence called the Blue Sock Award, and many students appear to highly value this award. However, sometimes the peer pressure has negative consequences. For example, a student who is taking the first Studio course should not feel

that they must have the same skills as a peer taking the final Studio course, yet this attitude many times prevails, creating a negative personal perception. In the Studio, we often use past exemplary student projects as a source of design ideas and inspiration and this can exacerbate this attitude. Although we have confronted this negative perception within Studio class meetings, it is a difficult perception to change once established. The positive side of this is that it serves to challenge students to do their very best because they know their peers will be critiquing their work.

Novice students are prone to pay attention more to superficial aspects of a project, such as its graphic design, than its deeper design components, such as its organization and the nature of learner engagement. Students often compare themselves to their peers on these superficial dimensions. We would not be the first to point out that an area of weakness among educational multimedia in the profession is in the area of learner interaction. As a way to promote more creative designs in which learners are engaged in meaningful and challenging activities within a multimedia project, the Studio instructors have instituted an award called the "Creative Interaction Award." We hope this instructor-driven award recognizing innovative interactions will help to motivate our student designers to consider more carefully the way in which they design learning environments.

Instructor-provided structure

The question of who decides what will be learned and by what means is a contentious one in the constructivist literature. Radical constructivists oppose most top-down structure, whereas the literature on scaffolding accepts the need for structure at the beginning of a new learning experience. When the Studio was first implemented in 1998, the Studio instructors opted for a minimalist position on structure. Except for a few special events, such as the Studio orientation at the beginning of the semester and the Studio showcase at the end, attendance at all other events was optional. Instructors believed that if a student has already mastered a skill to be covered in an upcoming class or workshop, or simply has no need for that skill in their project, the student should not be "held captive" by being forced to attend. In order to empower students to be successful self-directed learners, the instructors prepared and conducted a wide collection of optional skill workshops and design seminars with the understanding that students would attend those they felt were relevant to them. This approach, though having a strong theoretical rationale, did not work well in practice. We found that students did not make good choices about when to attend. Interestingly, many students, even those who ironically opted not to attend, voiced the opinion that they wanted more structure (Song and Hill 2004) and more mandatory classes, as exemplified by the student letter shown in Table 3. Ultimately, we settled on a structure in which attendance is required by all students for approximately the first half of the term.

Peer mentoring

One instance of research data that led to specific changes in the Studio curriculum concerns the way mentoring is approached in the Studio. For the first several years, mentoring was encouraged and expected to occur as a natural outgrowth of the collaborative structures built into the curriculum, such as the participation of "junior" members of the community in the final course project teams, as well as the requirement that a certain number of desktop critiques or "desk crits" be given and received. However, Clinton (2007) found that the first course tended to attract a significant number of students who lack the expected

Table 3 Letter from a student

Hello Dr. _____,
Per our conversation, I would like to make following comments and recommendations for the Studio classes. As a graduate student in IT I have already taken two semesters of EDIT 6190 and one semester of EDIT 6200.
I recommend mandatory classes for the three studio courses from 5:00 to 8:00/9:00 pm on Thursday up to the mid-term of each semester
Why?
Part of the rationale behind studio classes is to facilitate student learning by interaction amongst each other (It should be clear to you that much of your experience depends on you and your peers). Coming to a class from 5:00 to 8:00/9:00 in the first part of semester will greatly enhance this objective. It will be a place for EDIT 6190, EDIT 6200, and EDIT 6210 students to come to know each other, share their experiences, ask questions and work on their respective projects. It seems that students have more time at the first part of each semester for exploring and experimenting with different ideas and learning tools.
The pressure of finishing the project and course requirements usually mounted at the latter part of semester. For this reason, this mandatory class should be held in the first part of the semester.

background in multimedia skills (an enrollment choice that is left up to students, though all interested students received strongly worded written advice about taking a basic technology course first if one lacks this background). These students are generally the ones who do not adapt as well to the self-directed learning aspect of the Studio and express the need for more structured instruction, a finding corroborated by Lee (2009). Clinton (2007) recommended instituting a change in which final course students are required to dedicate their service hours specifically to mentoring and tutoring of their junior peers. An organized approach to this idea was instituted in the fall of 2007. This change effectively moved a certain amount of the mentoring from the realm of the voluntary to the mandatory, helping to ensure a higher overall level of mentoring each semester. An outgrowth of this increased level of mentoring structure was the introduction of several "Project Days" during the course of the semester, in which all students meet together in a shared open lab time that is specifically dedicated to giving and receiving support.

Conclusions and implications

Creating effective educational multimedia requires many people with many skills, talents, and experiences. The abilities needed to complete a successful project are necessarily distributed across the development team. Examples of these include knowledge of the subject matter, project management, instructional design, evaluation, graphic design, and a wide array of computer tools (authoring/programming, graphics, animation, etc.). The increase in (and diversification of) Web-based forms of instructional materials further complicates this design process, requiring not only another layer of technical sophistication, but often complete rethinking of how instructional materials ought to be designed. At the core of all of this is a creative and collaborative problem-solving process in which members of the team must somehow learn how to work with and rely upon each other.

Unfortunately, graduate programs that prepare people to join these development teams rarely teach in a way that reflects these realities. Even the most innovative of instructors may have difficulty providing their students with authentic and collaborative design experiences under the constraints of the one-course/one-instructor model. Faculty often struggle with these problems, but are usually stymied in how to initiate change in their departments or colleges.

The Studio curriculum has been operating since 1998. Its design was strongly influenced by contemporary learning theory. We feel it offers a helpful example of how to model a constructivist epistemology in an adult learning environment. A great mistake that is often made when interpreting and analyzing applications of constructivism to education is that it is synonymous with discovery learning and that instruction is the antithesis of such a philosophy (see Kirschner et al. 2006 and Mayer 2004, for examples of this misconception). In contrast, a mature constructivist view looks to understand when instruction is not the most appropriate route to learning, or conversely, when instruction is most needed for learning to occur (Bransford et al. 1999). Understanding the difference is probably the most challenging aspect for any teacher in a constructivist learning environment. A constructivist teacher is not interested in the quickest learning if this means that learning will remain shallow and decontextualized. Finally, even if a constructivist approach to learning, as embodied in the Studio, is not the best approach for every single learner, it provides at least one contrasting model of education for the adults who experience it.

Designers of the Studio curriculum envisaged this program as a unique endeavor that would not only serve the needs of one university but would also make an important contribution to the Instructional Technology field. Information about the Studio has been shared at professional conferences and in other contexts over the years and the Studio Handbook and website have been made freely available. However, this article is the first full academic write-up of the Studio for a major journal and we offer it as an additional resource for those interested in implementing constructivist learning environments for training professionals in our field. We acknowledge that a more robust evaluation effort, perhaps including external reviewers and data from graduates, would have been ideal, and this has not been achieved. However, personal communication from colleagues in other IT programs has indicated that efforts have been made to emulate aspects of the Studio in at least five other programs of which we are aware. These efforts have met with mixed success, as is expected since each university is unique, not only in terms of the characteristics of the institution but also the specific program faculty and the clientele served. However, we believe aiming high at these ideals of learner-centered instruction is worth the effort at any institution of higher learning, even if success should be difficult to measure, elusive to achieve, or manifest in a markedly different form than what we have here presented.

References

Allen, T. D., Russell, J. E. A., & McManus, S. E. (1999). Newcomer socialization and stress: Formal peer relationships as a source of support. *Journal of Vocational Behavior, 54*, 453–470.

Allessi, S. M., & Trollip, S. R. (2001). *Multimedia for learning: Methods and development* (3rd ed.). Boston: Allyn & Bacon.

Anderson, J. R., Reder, L. M., & Simon, H. A. (1996). Situated learning and education. *Educational Researcher, 25*(4), 5–11.

Barrett, T. (2000). Studio critiques of student art: As they are, as they could be with mentoring. *Theory into Practice, 39*(1), 29–35.

Bers, M. U., Ponte, I., Juelich, K., Viera, A., & Schenker, J. (2002). Teachers as designers: Integrating robotics in early childhood education. In *Information Technology in Childhood Education Annual* (pp. 123–145). Charlottesville, VA: AACE.

Boyer, E. L., & Mitgang, L. D. (1996). *Building community: A new future for architecture education and practice. A special report*. Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (1999). *How people learn*. Washington, DC: National Academy Press.

Brockett, R. G., & Hiemstra, R. (1991). *Self-direction in adult learning: Perspectives on theory, research, and practice*. New York: Routledge.
Brookfield, S. (1984). Self-directed learning: A critical paradigm. *Adult Education Quarterly, 35*, 59–71.
Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32–42.
Burroughs, S., Brocato, K., & Franz, D. (2009). Problem based and studio based learning: Approaches to promoting reform thinking among teacher candidates. *National Forum of Teacher Education Journal*, 19(3), 2009.
Candy, P. C. (1991). *Self-direction for lifelong learning: A comprehensive guide to theory and practice*. San Francisco: Jossey-Bass.
Clinton, G. (2005). *Graduate student experiences of creativity and flow during training in design and development.* Paper presented at the annual conference of the Association for Educational Communications and Technology, Orlando, FL.
Clinton, G. (2007). *Creativity and design: A study of the learning experience of instructional design and development graduate students*. Unpublished dissertation, The University of Georgia.
Clinton, G., & Rieber, L. (2005). Creativity, flow, and the training of graduate students in design and development skills. *Instructional Technology Monographs, 2*(2). Online: http://projects.coe.uga.edu/itm/archives/fall2005/gclinton.htm.
Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. London: Sage Publications.
Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.
Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: Harper Collins Publishers.
Dewey, J. (1916). *Democracy and education*. New York: McMillan.
Dick, W. (1995). Instructional design and creativity: A response to the critics. *Educational Technology, 5*(4), 5–11.
Dutton, T. A. (1987). Design and studio pedagogy. *Journal of Architectural Education, 41*(1), 16–25.
Fiedler, S. H. D. (1999). *The Studio experience: Challenges and opportunities for self-organized learning.* Retrieved September 1, 2002, from http://it.coe.uga.edu/studio/fiedler.html
Grant-Vallone, E. J., & Ensher, E. A. (2000). Effects of peer mentoring on types of mentor support, program satisfaction and graduate student stress: A dyadic perspective. *Journal of College Student Development, 41*, 637–642.
Harel, I., & Papert, S. (Eds.). (1991). *Constructionism*. Norwood, NJ: Ablex.
Holschuh, D. (2006). *In the company of designers: Examining the culture of design in the design studio.* Unpublished dissertation, The University of Georgia.
Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new philosophical paradigm? *Educational Technology Research and Development, 47*(1), 61–79.
Kafai, Y., & Resnick, M. (1996). *Constructionism in practice: Designing, thinking, and learning in a digital world*. Mahwah, NJ: Lawrence Erlbaum Associates.
Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75–86.
Krause, J. (2004). *Design basics index*. Cincinnati: How Design Books.
Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.
Lawson, B. (1980). *How designers think*. London: The Architectural Press, Ltd.
Lee, S. J. (2009). *Exploring students' beliefs about teaching and learning in relation to their perceptions of student-centered learning environments: A case study of the studio experience.* Unpublished dissertation, The University of Georgia.
Mayer, R. (2004). Should there be a three-strikes rule against pure discovery learning? The case for guided methods of instruction. *American Psychologist, 59*, 14–19.
Michael, J. A. (1980). Studio art experience: The heart of art education. *Art Education, 33*(2), 15–19.
Moran, J. J. (2005). A model for promoting self-regulated learning. *New Horizons in Adult Education, 19*(1), 15–26.
Nelson, H., & Stolterman, E. (2003). *The design way*. Englewood Cliffs, NJ: Educational Technology Publications.
Orey, M., Rieber, L. P., King, J., & Matzko, M. (2000). *The Studio: Curriculum reform in an instructional technology graduate program.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.
Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas*. New York: Basic Books.

Papert, S. (1991). Situating constructionism. In I. Harel & S. Papert (Eds.), *Constructionism* (pp. 1–11). Norwood, NJ: Ablex.
Pargas, R. P., & Weaver, K. A. (2005). Laptops in computer science: Creating the "learning studio". *New Directions for Teaching and Learning, 101*, 43–49.
Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *The Journal of the Learning Sciences, 13*(3), 423–451.
Rieber, L. P. (2000). The Studio experience: Educational reform in instructional technology. In D. G. Brown (Ed.), *Teaching with technology: Seventy-five professors from eight universities tell their stories* (pp. 195–196). Bolton, MA: Anker Publishing Company.
Rieber, L. P. (2003). Microworlds. In D. Jonassen (Ed.), *Handbook of research for educational communications and technology* (2nd ed., pp. 583–603). Mahwah, NJ: Lawrence Erlbaum Associates.
Rieber, L. P., Orey, M., & King, J. (2008). *Handbook for the EDIT Studio experience at the University of Georgia*. Retrieved August 28, 2008, from the University of Georgia, Department of Educational Psychology & Instructional Technology Web site: http://it.coe.uga.edu/studio/studiohb.pdf
Rose, D. H. & Meyer, A. (2002). *Teaching every student in the digital age: Universal design for learning*. Alexandria, VA: Association for Supervision and Curriculum Development (Online). http://www.cast.org/teachingeverystudent/ideas/tes/
Salomon, G., & Perkins, D. N. (1998). *Individual and social aspects of learning*. Retrieved April 8, 2003, from http://construct.haifa.ac.il/~gsalomon/indsoc.htm
Slavin, R. E. (2003). *Educational psychology: Theory and practice*. Boston: Pearson Education.
Song, L., & Hill, J. (2004). *Constructivist learning environments: What do students' perspectives tell us?* Paper presented at the annual conference of the American Educational Research Association, San Diego, CA, April.
Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques* (2nd ed.). Newbury Park, CA: Sage.
Tripp, S. (1994). How should instructional designers be educated? *Performance Improvement Quarterly, 7*(3), 116–126.
Turbak, F., & Berg, R. (2002). Robotic design studio: Exploring the big ideas of engineering in a liberal arts environment. *Journal of Science Education and Technology, 11*(3), 237–253.
Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
West, R. E. (2009a). *Communities of innovation: Exploring collaborative creativity within a community of graduate instructional designers*. Unpublished dissertation, The University of Georgia.
West, R. E. (2009b). What is shared? A framework for understanding shared innovation within communities. *Educational Technology Research and Development, 57*(3), 315–332.
Winograd, T. (Ed.). (1996). *Bringing design to software*. New York: ACM Press/Addison Wesley.
Wolcott, H. F. (1994). *Transforming qualitative data: Description, analysis, and interpretation*. Thousand Oaks, CA: Sage.
Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Psychology and Psychiatry, 17*(2), 89–100.

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