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ABSTRACT

The purposes of this paper are to: share insights into the development of online collaborative learning experiments; discuss the role of instructional systems design (ISD); and present examples of design components within an ISD-based framework. The model presented explains the people, processes, and products that are involved in creating online learning communities for K-12 students and teachers. The paper first reviews research and theory from both constructivist and ISD literature, arguing that a model that draws on the strengths of both perspectives is preferred. The product of the model presented is a sustained learning community, and an active network of people conducting projects using networked connections and resources. Discussion then moves to the development of learning communities intended to support many simultaneous projects employing the common stages of ISD, which are discussed in detail. These stages are: management (creating the development team); front end analysis (selecting a theme, identifying resources); design (providing communications tools, identifying shared interests and teams); development (developing projects); implementation (participants produce original work, share process information); evaluation (assessing published work and providing feedback, evaluating the system); and dissemination (sharing information on process, outcomes, and useful products). A table shows the stages of development, key activities, and evaluation issues. (Contains 36 references.) (AEF)

An ISD Model for Building Online Communities: Furthering the Dialogue

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Abstract

This model explains the people, processes, and products that are involved in creating online learning communities for K-12 students and teachers. It is hoped that by organizing and making explicit what is done, the level of discussion will be raised and practice will be improved. The purpose is to help those who would engineer the process, analyze it, shape it, and evaluate it in order to provide better educational experiences for learners. This paper reviews research and theory from both constructivist and ISD literature, arguing that a model that draws on the strengths of both perspectives is preferred. The product of the model is a sustained learning community, and an active network of people conducting projects using networked connections and resources.

Introduction

This paper was originally written in response to a special issue of Educational Technology (Sept-Oct, 1995) entitled "Constructivist Learning Environments" that highlighted the tension between educational researchers conducting constructivist learning experiments and the Instructional Systems Design (ISD) community. Lin et al. (1995) provide an invitation to dialogue, arguing that such an effort is worth undertaking.

The author has had the opportunity to work with constructivist educational researchers outside the field of ISD. Some of these researchers see ISD-type programs as being on the "wrong side of a paradigm shift". This paper examines the knowledge that is growing around the use of networks for collaborative learning, and the role that ISD processes can play in advancing this work. It hopes to contribute to the dialogue proposed by Lin et al. (1995) by discussing some of the strengths of the ISD approach. In order to do this, this paper attempts to do the following:

1. Share insights into the development of online collaborative learning experiments
2. Discuss the role of ISD, challenges, and how ISD can be relevant
3. Present examples of design components within an ISD-based framework

Wilson, et al. write, "The literature on constructivism is filled with theoretical dialogue but few design models or concrete suggestions for practice". In their article, Lin, et al., argue that "a structure for organization and management could be of great benefit to those attempting to implement the idea of learning communities" (Lin et al., 1995). ISD seems well suited to provide this structure.

People trained in ISD have unique talents to bring to bear on the development of collaborative experiments. According to Lin, et. al., "A strength of the instructional design community is its ability to articulate, manage, and systematize the process involved in designing effective learning environments" (p. 59).

Educational Context: A new paradigm?

There is a growing body of literature that discusses using computer networks as an interactive communication-rich environment to foster collaboration and shared construction of knowledge (Fishman and Pea, 1994; Gordin, et al., 1994; Gomez, et al., 1994; Hunter, 1993; Koschmann, et al., 1993; Ravitz, 1995; Riel, 1989; Romiszowski and Ravitz, 1997). To the extent that these networks are used to form partnerships for social and educational experiences beyond the classroom, one sees the development of a "unique model of network learning" (Riel, 1994).

For developers, the Internet has helped to bring about a shift from an "instructional" model to an information-age "conversational" model of learning (Chang and Romiszowski, 1994; Reigeluth, 1994; Romiszowski and Ravitz, 1997). Jonassen (1995) notes that while new technologies can make individualized learning more powerful, they can also be used by constructivists "to support conversation among communities of practitioners and learners". For leaders of this movement, it is necessary to reconceptualize "the computer as a knowledge presentation device to one that supports a pedagogical focus on communications in support of collaborative learning"

(Koschmann et al., 1993). Fishman and Pea (1994) write that "the network's true power comes from the synergy of many dispersed minds working together to solve problems and discuss issues."

This context for this model involves the creation of environments that support collaboration and cooperative (Heinich, Molenda et al., 1996, p. 322) learning experiences. Learning is seen as taking place through the social construction of knowledge with authentic activities providing greater motivation and meaning to students (Collins, 1994; Riel, 1994; Riel and Levin, 1990). Furthermore, a more active role for teachers and students is being sought through the "participatory-design" of instruction (Silva and Breuleux, 1994). Instead of being overly prescriptive, teachers and students "help define or select content and design their own learning experiences" (Wilson, et al, 1995). In sum, the purpose of this model is not to deliver instruction, but to foster meaningful learning experiences.

Challenges for ISD

Some problems with the traditional ISD approach have been noted in the literature. It is clear that online learning communities cannot be pre-packaged and delivered. Instead, constructivist projects may require that "all major constituencies be represented on the design team, including teachers and students" (Wilson, et al., 1995). Moreover, this adaptation must occur at each site where implementation occurs. "Effective learning communities must be reinvented from location to location rather than simply transported and implemented" (Lin, et al., p. 58). Perhaps the greatest challenge, then, is to view ISD as less deterministic (Rowland, 1995, p. 21), particularly in terms of learning outcomes. Andrews and Goodson (1980) acknowledged that discovery learning "might reject the specification of objectives and corresponding direct match of instructional events to these objectives" (p. 13). Constructivist theorists extend this, suggesting that it is often appropriate for students to undertake engaging tasks, and "let any facts and concepts be learned incidentally" (Collins, 1994).

Indeed, some might argue that the development of non-deterministic learning experiences is not instructional design! Before this work is dismissed as "not instructional design" it is important to consider the costs to the field, and individuals in the field, that this attitude might cause. The risk is that non-ISD researchers will press ahead, while students of ISD will not be supported and will be alienated from the work of would-be colleagues. The model that follows draws upon the strengths of ISD, the management and process-based expertise that ISD offers, and places development activities within an ISD framework.

The Model -- developers, learning tasks, and procedures

What is presented here is a non-deterministic approach to instruction that involves teachers, learners and mentors in the process of developing and delivering instruction. The developers in this model are people seeking to build connections between K-12 teachers and students with people and resources available outside the classroom – other schools, museums, community centers, universities and research centers.

The assumption is that the developers are:

1) using Internet-based technologies
2) to link classrooms with outside people, communities, resources, and organizations
3) in order to support authentic, collaborative, network-based projects
4) by "early adopters" -- people ready, willing and able to participate in online collaboration, and
5) using an ISD approach (when appropriate) to inform the design, development and evaluation process.

A successful implementation of the model would deliver a lasting resource that supports many types of learners and learning activities. It would provide the following:

- resources and support for teachers
- implementation in the classroom, with the system extending outside
- interaction between students and teachers with peers and mentors
- geographically distributed participants
- electronic network-based and facilitated conversations
- communication intensive environments
- flexible means and ends

Illustrative Examples

Two example development efforts are used to illustrate the proposed model.

1) Learning Community: Focus Promised Land is a pilot effort sponsored by Discovery Communications, Inc. and undertaken with the support of Interactive Frameworks, Inc., (then Duggan Associates) and AskERIC at Syracuse University. The author served as a design consultant on the AskERIC team. William Duggan from Interactive Frameworks, Inc. was helpful in contributing ideas to this paper. The Promised Land (PL) was undertaken to advance opportunities for rich learning experiences via the Internet and to support ongoing exploration by students and teachers concerning issues raised in the televised series of the same name. The televised series involved the experience of African Americans who migrated earlier in this century from the South to northern US cities. Numerous schools already receive Learning Channel broadcasts with a pre-packaged curriculum guide. For this pilot, those with Internet access were invited to participate online after viewing the televised series. Teachers were asked to join a Listserv and visit the PL Web site in order to share ideas and to begin developing projects with their students. Ultimately, classrooms were encouraged to propose, develop, and carry out projects while taking advantage of the availability of online resources, facilitators and mentors. The goal was to support teacher innovation, develop meaningful student learning, and foster reflection in the local community and via Internet-based communications. For more information see: -- http://school.discovery.com/learningcomm/promisedland/.

2) The Online Internet Institute is a collaborative online experiment for the professional development of teachers first sponsored by the National Science Foundation (NSF Grant No.REC-9554232). The Online Internet Institute (OII) was designed to support teachers' use of the Internet. It combines regional face-to-face learning with the opportunity to experience online collaboration first hand. Small groups of individuals collaborate and share with the online education community. Information on their experiences and the understandings they gain are collected and made available online. The author has served OII as a designer and evaluator. For information see: -- http://oii.org.

Margaret Riel's work on the AT&T Learning Circles Teacher's Guide (http://www.att.com/education/lcguide/) is also provided as an example for consideration. While the author was not involved in the development of this work, and therefore has few insights into the development process, some useful structures are provided that might be incorporated into this model. It is now available through the International Education and Resource Network (I*EARN). For more information see: -- http://www.iearn.org/iearn/circles/lc-home.html.

Types of Learning Tasks

It should be noted that the type of learning tasks one sees on the Internet varies greatly (Eisenberg and Ely, 1990, Harris, 1994; Levin, et al, 1989). What is important "regardless of the technology selected, is to connect technology to powerful learning paradigms" (Jones, 1994, p. 57). Some of the most powerful Internet-based projects take advantage of a unifying theme (such as an historical event) to draw in the interests of diverse people. Other projects are designed to share data and resources (Gordin, et al. 1994), or to build on a shared experience or purpose (Riel and Levin, 1990).

> Such designs ideally allow students and teachers to (1) work on authentic, meaningful, and challenging problems; (2) interact with the data in user friendly ways that allow some student control of learning. (3) build knowledge together within a learning community that is broader than a few students or schools with similar characteristics and interests; and (4) interact with practicing professionals and community members (Jones, p. 57).

The focus of this model is to support local participants as they develop activities that are meaningful to them. For example, taking advantage of geographic diversity, participants can share online that which is unique in their communities. PL participants shared locally produced recipes, worked with local artists and musicians, collected oral histories of community members, and discussed population demographics. OII collaboration was based on the shared issues and concerns of teachers as they attempted to learn about and integrate the Internet into their own teaching. In both cases, individuals develop and share their work across distance and time, potentially benefiting from the experiences of others. Thus, based on the above discussion, this model addresses the aspects of instruction that were described by Lin., et al (1995):

> The nature of efficient learning communities can be summarized as providing students opportunities to:

1) plan, organize, monitor, and revise their own research and problem solving;
2) work collaboratively and take advantage of distributed expertise from the community to allow diversity, creativity, and flexibility in learning;
3) learn self-selected topics and identify their own issues that are related to the problem-based anchors and then identify relevant resources;
4) use various technologies to build their own knowledge rather than using the technologies as 'knowledge tellers'; and
5) make students' thinking visible so that they can revise their own thoughts, assumptions, and arguments" (p. 59).

Procedural description of the Model

Before work can begin, a substantial commitment must be made to a large-scale development effort. Because of the resource-intensive nature of this work, it is doubtful that individuals teachers or students could hope to undertake a development effort of this nature. Both PL and OII relied on the expertise of services such as AskERIC which developed the PL web pages and provided the technological tools required for online collaboration. OII benefited from a server and a threaded, web-based discussion environment supported by BBN Systems and Technologies via another NSF-funded project.

There are guidelines elsewhere in the literature of how teachers can develop collaborative projects for their own students using the Internet (Harris, 1994; Harris, 1995; Levin, et al., 1989; Riel, 1993; Rogers, et al, 1990). These guidelines (see http://www.ed.uiuc.edu/Guidelines/) are considered important for this model. The rest of this paper discusses the development of learning communities intended to support many simultaneous projects. It employs the common stages of ISD: management, front end analysis, design, development, implementation, evaluation and dissemination. By attempting to integrate this work into an ISD framework the author recognizes the benefits provided by ISD processes. In this case, the result is a process, or system for learning rather than an instructional product (Gustafson and Powell, 1991, p. 7).

1. Management (creating the development team)

Management of people and processes is a central component of the model. OII started with a face-to-face meeting of two dozen individuals including staff, design consultants, partner organizations, mentors, and participating teachers. Subsequent gatherings have taken place at national and state educational conferences where key issues are addressed. PL started with discussions between Discovery Communications, Duggan Associates and AskERIC.

Interactive environments enabled these teams -- developers, mentors, teachers, service and resource providers -- to improve the process, features, and services being developed. Working in an online environment offers opportunities for better coordination, and the interactivity of the medium can provide a unique level of management responsiveness, especially important at the pilot stage of development. Nonetheless, the complexity of the task is daunting. Strategies are lacking for "managing a large number of human resources and bringing them together to reach consensus on their goals" (Lin et al., p. 60). Once participants become involved, it becomes necessary to have a facilitator in place to "take on the responsibility of monitoring and facilitating the group interactions" (Riel and Levin, p. 164). This role should be defined early in the process and performed by a member of the development team, or someone who works very closely with the developers. OII had one or two staffers who served as facilitators and subsequently tried to delegate responsibilities to a site facilitator in each school or district that joined. For PL, the developers served as online facilitators, while the classroom teacher or local mentors could be thought of as the local facilitators, monitoring and supporting the work of students.

2. Front End Analysis (selecting a theme, identifying resources)

It is necessary to establish the basis for this work in terms of meeting the needs of participants. PL started with a *central theme*. The people who became involved were those who saw opportunities to make the project meaningful to them. In contrast, OII teachers began with the problems they wanted to address as learners, then sought out resources, mentors, and collaborators. In both cases, the core idea around which each project is constructed is something of value to the participants and their local communities.

Early in the development process it is necessary to *identify resources* that are available. One of the strengths of using the Internet is that existing projects, mentors, subject matter experts, and organizations can be made available to support investigations. It is the responsibility of the developer to initially evaluate these

resources, and foster relationships with individuals or organizations who may have increased demands placed on them as a result of participation. Resources include online, regional, and local data sources, as well as human resources. The Promised Land secured subject matter experts (SMEs) in communities where schools were active to help students and teachers develop their projects in different subject areas. "SMEs can help design learning experiences: designers manage projects, build teams, check for content and accuracy, and serve as model learners and teachers." (Wilson, et al, 1995). PL also provided access to people and content used in the production of the series; the narrator was available to teachers and students, in addition to scripts, transcribed interviews, music and video footage, and photographs that were used in the series. OII started with a cadre of mentors to support teachers' investigations.

3. Design (providing communications tools, identifying shared interests and teams)

In a constructivist model, the central role of the developer shifts from creator of instruction to manager of processes (Wilson, et al., 1995). Part of the design process includes the development of *communication channels* to support exchange of ideas, e.g., via Listservs. The design must address the process and means by which participants will communicate with one another and find shared interests. Riel and Levin (1994) refer to this as providing "response opportunities" to all participants.

There must be a basis for interaction because the model assumes no prior knowledge between participants. "Student participants on networks rarely begin their interaction with any knowledge of each other" (Riel and Levin, p. 162). For PL participants, a shared experience was provided by the televised series. For OII participants, groups were formed based on shared learning needs, e.g., identifying quality resources.

The design must afford opportunities for matching mentors, resources, and participants and fostering the development of relationships; this includes mechanisms for collecting, synthesizing, and sharing data provided by participants about their interests. PL relied heavily on the facilitators to help build these connections, while OII experimented with automated ways of providing information and making connections via a shared database. By providing detailed information about all participants, strong "virtual" groups were formed within OII that had almost no face-to-face contact but developed valuable products nonetheless, e.g., a downloadable tutorial.

4. Development (develop projects)

During this stage, participants are assisted in the *development of projects* based on their interests and groups. PL developed a unique approach called "toe-wade-dive" to support project development:

a) toe -- participants share their project ideas and receive feedback and suggestions from interested parties;
b) wade -- participants share their plans for developing the project;
c) dive -- participants announce their intention to go forward when they are ready

The PL approach permits projects to start and end according to their own timeline. This is an important trade-off to consider, while some projects may benefit from a fixed timeline for all participants, particularly one that is sensitive to the school calendar (Rogers, et al., 1990).

Throughout the development process, participants are encouraged by the facilitator to interact with resource people, mentors and each other. While their activities may be very different, each group should share its planning with others. Communication during project development offers opportunities for learning -- mentors may be involved throughout the process to "confront learners' naive, intuitive theories and to scaffold their learning" (Wilson, et al., 1995). The presence of others may offer teachers assistance, including discussion of pedagogical issues, e.g., how designing the project can promote the development of meta-skills such as "exercising effective learning control" (Wilson, et al., 1995).

A final development issue involves the structuring of tasks, and the giving and receiving of feedback between participants. Riel's (1990) work on AT&T Learning Circles demonstrates one way of structuring these projects that is worth considering; each group follows a similar schedule ad guidelines for developing and sharing their work.

5. Implementation (participants produce original work, share process information)

During the implementation phase, learners work with each other and mentors to produce original work in teams. They are guided by the plans set forth in the previous stage. Increased interactions across the system may or may not occur. It is worth noting that while this is an "online" model, much of the work may take place offline. It

is difficult for developers or facilitators to keep track what is happening in distant locations. Regular updates should be provided from the sites.

Additionally, efforts must be made to encourage participants to include "process information" in their updates -- problems encountered, solutions attempted, lessons learned, changed plans, and so on. This is perhaps the most difficult problem that designers face, creating the expectation for reflection in and on action (Schon, 1983) both for the benefit of the group and the individual. Spitzer, et al. (1994) describe the process of "fostering "reflective dialogue" including different roles and strategies for facilitators.

If participants do not document and share the process of implementation, opportunities for reflection, dialogue and feedback may be lost, and the end products themselves become less meaningful. It is necessary for the developers to allow learners and teachers to take control of and guide their own learning, while still offering support and encouraging interactions with the larger group. Having an audience itself can be motivating. "Students enjoyed working for and reading the work of other students even when they knew little about them" (Riel and Levin, 1990), and the receiving feedback can be beneficial, "The most powerful and effective source of feedback is another person" (Johnson and Johnson, 1996, p.324). In some, communication during project development and implementation offers important opportunities for learning -- interactions with peers, mentors, facilitators, and SMEs that are often not available to classroom projects.

6. Evaluation (assessing published work and providing feedback, evaluating the system)

When one is finished with a project, an important part of the model is to share this product with others and request feedback (Rogers, et al., 1990). It is necessary to publish the work that took place, not only to help assess the project and its outcomes, but to facilitate learning which happens when learners "explain what they are doing and why" (Goldberg and Richards, 1995, p. 6). Presentation of work should reference the original goals, as well as what happened along the way. Given that this presentation may be asynchronous, e.g., provided to others via a Web page, it should include overview that describes the essential elements of the project for anyone who might serve as a reviewer, including the basics -- who, why, where, when, and how...and what type of feedback is sought! It may be useful for designers to provide a template for introducing the project, a consistent structure, e.g., creating a sample web page that each group can modify to introduce their projects.\

Formative assessment should happen throughout the development and implementation process -- developers should be in contact with participants or facilitators on a regular basis. Rowland (1995) suggests that in learning communities feedback and modification is a daily process (Rowland, 1995, p. 60).

Finally, the work can be summatively evaluated based on a number of criteria. Riel and Harasim (1994) discuss analysis of network design and structure, as well as social interactions, and individual learning outcomes. In terms of the latter, it is still necessary to work on the development of "technology-based strategies for enhancing assessment and the construction of portfolios" (Lin, et al., p. 60), and it may be advisable to assess some student learning outcomes through complex pre-post testing.

To some extent a successful design can be inferred if it fosters sustained use by participants, as well as through systematic observation and feedback (p. 14-15). An important social interaction issue concerns the extent to which participants feel comfortable taking "risks" in sharing their ideas. "A free exchange of ideas, opinions, and feelings is the lifeblood of collaborative learning (McKinley, 1983, p. 16). It is also necessary to consider progress toward goals:

> Teachers should become innovators in terms of their own methods and their support for student collaboration, the community should increasingly perceive students as authentic contributors of knowledge, and the participants should be able to reflect on their own experience, decisions, and progress. Ultimately, what students create should be valued not just by the students and teachers, but by members of the broader community. Artifacts of learning should be exploited as such, not only by individual teachers, but by the community of practice (Will Duggan, personal communication, 3/23/96).

Finally one should consider the system itself -- its sustainability, transferability, costs and benefits (Collins, personal communication, 10/29/95). By showing these outcomes, learning communities can "be accountable to larger constituencies" (Lin, et al., p. 60). Further discussion on the evaluation of collaborative online projects, including methods for the collection and analysis of data is available (Kozma and Quellmalz, 1996; Ravitz, 1997a; Ravitz, 1997b; Riel and Harasim, 1994).

7. Dissemination (sharing information on process, outcomes, and useful products)

Finally, is appropriate to expect findings to from this work to be shared, and for successful efforts to be disseminated through the marketplace, or through the educational system. The "moral purpose" (Fullan, 1993, p. 4) must be remembered - to bring about improvements in the way young people are taught and learn. The reason for dissemination is so others can try to replicate and improve on previous work. Much discussion now centers on the profit motive in education which many see as a threat. It is worth noting that two of the models discussed here were developed with corporate financing and are available, in full, on the Web for public viewing. Regardless of the reasons why this work is on the Web, the opportunity should not be lost to view it, and to attempt to improve upon it. A larger issue concerns the ability of this work to be reflective itself, demonstrating lessons learned by reporting problems encountered, obstacles and how they were overcome. There must be some effort to develop the research focus of these development efforts and share evaluation results so that more can be learned from them.

Analysis of the proposed Model

The model includes classroom-level implementation, production of artifacts of learning, and an active network of people -- a sustained learning community comprised of people, processes, and products (Table 1) -- that is actually a system in itself (Gustafson and Powell, 1991, p. 3). This model attempts to account for the major tasks (Table 2) involved in developing an online collaborative learning environment.

Using the framework provided by Edmonds, Branch & Mukherjee (1990), it can best be understood as a descriptive model, derived mostly from procedural, as opposed to causal, knowledge. It can only be considered a "soft-system" with loosely determined interaction between components. Implementation requires a high level of expertise -- as one must manage the complexity of the interactions, provide facilitation, build relationships, and support group work in the classroom. The work extends to multiple levels, but ultimately is intended for use at the classroom level.

Using the framework provided by Gustafson and Powell (1991), one must note that this model requires a high commitment of resources and a team-based development process. The model requires careful selection and development of materials and assessment of participants' needs. Tryout and revision of this approach should occur over the course of many iterations with opportunities for distribution and dissemination built in as an inherent advantage of using the Internet as a medium. The model has generalizable characteristics, and replication of the process is encouraged for research purposes both within and beyond the K-12 contexts discussed here.

The Model Components (People, Process, Product, and Participation)

Key components of the model include people, process, and product, as well as participation. Instead of the learner working alone in "the world's greatest library", this model is based on connections between people from different walks of life. It attempts to create a process for the sharing of work in progress, and to provide products of learning that can be reviewed and discussed.

People: A model that breaks down the isolation of students and teachers from the outside world.	**Process: Building a community of learners who can share their work in progress**	**Product: Participants develop a number of products throughout the collaboration process**

* teachers * students * facilitators * mentors * online resources * local community groups * subject matter experts * information providers	* identifying a theme * identifying resources & mentors * creating a delivery mechanism * receiving commitment from participants * facilitating interactions * supporting project development * publishing * structuring feedback	* groups established * mentor identified * email messages sent * projects defined * multimedia presentations delivered * student online portfolios * feedback from peers/experts & teachers * evaluation data on people, process and product

Table 1. Examples of People, Process and Product *

The Fourth P: Participation

A key "formative" issue to be addressed throughout the development of such a project is to make sure that people are involved and committed to the process. As Riel and Levin (1990) warn, "Too many networking communities have fallen silent, as electronic ghost towns . . . . a quick introduction at an electronic cocktail party which fails to lead to any further exchange" (p. 145-6). Riel's (1990) work for the AT&T Learning Circles draws on this research by providing many check points where participants confirm their commitment to the process. While this model is not as structured, it does provide formative questions that developers should ask themselves at each stage:

Stage of Development	Key Activities	Evaluation Issues
Management	Development of coordinated team	*Is the team responsive and demonstrating shared understandings?*
Front End Analysis	Identify topic(s) of interest Develop or find relevant resources Create relationships with people and groups who can support projects.	*Is there sufficient interest? Are resources and personnel available to support inquiry?*
Design	Provide tools for communications. Facilitate sharing of interests. Matchmaking with resources. Form groups across distances.	*Are people taking advantage of response opportunities and sharing information about themselves and their interests? Are all participants making connections?*
Development	Groups develop projects with support of mentors and feedback Toe -> Wade -> Dive	*Are people sharing ideas and plans, and receiving feedback during development? Are mentors involved?*

Implementation	Support teachers and projects Publish updates	*Are people providing updates on a regular basis? Are they reflecting on their experiences and discussing the process?*
Evaluation	Publish completed work Give and receive feedback	*Is there evidence that learning occurred? Is background information provided to guide feedback? Is constructive feedback received, and responded to?*
Disseminate/Replicate	Developers share process information and products.	*Is the process of development documented enough to allow others to replicate? Are actual results demonstrated and discussed? Are difficulties and research issues raised?*

Table 2: Partial summary of activities and formative checkpoints during stages of development

Conclusion

There are drawbacks and risks to using a model like this. It is expensive, time consuming, and requires technological sophistication that many schools and organizations still lack (Heaviside, et al., 1997). It also requires significant changes in educational practices that may face considerable resistance. "Poorly implemented, the redefinition and blurring of roles can lead to chaos and confusion" (Wilson, et al, 1995). However, it is likely that only by developing and making explicit the models used to create such projects will practice be better understood and improved.

The projects presented here are essentially "non-ISD" examples. Although the author tried to present the work in light of an ISD framework, this is largely post-hoc. The author has attempted to argue for a more ISD-based approach to such work by placing it within such a context.

The best work is likely yet to come as the power of Internet-driven educational applications increases (Guzdial and Weingarten, 1996) and the extent of access and use in schools grows (Heaviside, et al., 1997). Unfortunately, many of the most advanced applications of the Internet are taking place outside the realm of ISD research. Is this an acceptable situation? What does it mean if the "best" models are coming from outside of ISD?

This paper may not have satisfied allegiant practitioners that principles of ISD have been followed in this model, or that the strengths of traditional ISD have been fairly represented. Nonetheless, this paper makes an effort to place the development of online learning communities into a framework for future consideration, one which draws on the strengths of both research communities. This paper has attempted to show that further dialogue is necessary -- ISD has something important to offer to this type of work, and can learn from others as well.

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* The online version of this paper includes a series of matrices showing the interaction of these components (Table 1). It also includes pointers to examples and online references, and initial attempts to create a graphic depiction of the model. It is avilable at -- http://idde.syr.edu/HTML/Ravitz/ide_model.html.

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