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Using Activity Theory to Design Constructivist Online Learning Environments for Higher Order Thinking: A Retrospective Analysis

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Abstract

Abstract. This paper examined a particular online learning activity, embedded within a computer supported collaborative learning (CSCL) environment incorporated as part of the larger context of participation in a unique national agricultural leadership development program. Process outcomes such as a high level of collaboration and active peer facilitation as well as demonstration by participants of a variety of holistic thinking skills were observed via a transcript analysis of online interactions. This led to speculations that the particular design features embedded within the context of the online collaborative *issues analysis project* (IAP), were thought to clearly reflect a constructivist approach. Methods to confirm this included evaluating the learning activity in light of nine characteristics of an authentic task in CSCL environments, and using activity theory as a conceptual framework with which to further examine the extent to which the IAP reflected the values and principles of a constructivist online learning environment.

Résumé. Cet article se penche sur une activité particulière d'apprentissage en ligne, intégrée dans un environnement d'apprentissage coopératif informatisé (CSCL), lui-même inscrit dans un contexte plus large de participation à un programme national de perfectionnement en leadership agricole. L'analyse de la transcription des interactions en ligne a permis d'étudier les résultats de ce processus, tels que le niveau élevé de collaboration et la facilitation active des pairs, ainsi que les capacités de raisonnement global dont ont fait preuve les participants. Ces résultats ont mené à des spéculations, selon lesquelles les caractéristiques particulières de ce concept, intégrées dans le contexte d'un *projet d'analyse de questions* (IAP) coopératif en ligne, reflèteraient clairement une approche

constructiviste. Parmi les méthodes confirmant ce fait, l'évaluation de l'activité d'apprentissage en fonction des neuf caractéristiques d'une tâche authentique dans les environnements CSCL et l'utilisation de la théorie de pédagogie active comme cadre conceptuel servant à une analyse plus poussée du degré auquel l'IAP reflète les valeurs et les principes d'un environnement d'apprentissage constructiviste en ligne.

Introduction

In his book Philosophical Tools for Technological Culture, Hickman (2001) offers an expanded definition of technology to "involve the invention, development, and cognitive deployment of tools and other artifacts…with a view to the resolution of perceived problems" (p. 12). A consistent theme throughout is Hickman's claim that technology encompasses procedures, processes, and methods of inquiry, not just hard technologies. Kennedy (2002) applies a similar definition to the field of inquiry known as instructional design (ID), claiming it as the "manifestation of a technology of instruction," [one that] "encompasses all technologies used to create learning experiences, and require that they serve out pedagogical needs" (p. 4). The processes and procedures of instructional design, as a meta-level technology, therefore, have enormous potential to influence the adoption and adaptation of a wide variety of hard technologies (e.g., computer mediated communication tools) for the purposes of education. However, this capability carries great responsibility to ensure that "best ID practice" is informed by principles and convictions distilled from a thorough understanding of relevant theory, and reflection on one's own personal values and professional experience. Expanding on this latter challenge, Gibson (1995, p. 10), claims the fundamental assumptions that instructional designers hold about the teaching and learning enterprise, and how they have operationalized (or not) these assumptions into models and designs for learning will be an important factor in using the variety of new computer mediated communications (CMC) technologies to their fullest educational advantage.

It is my view that adopting a *constructivist* approach to instructional design requires three things: an understanding of the central theoretical tenets and principles of constructivism, an awareness of the extent to which these resonate with one's own values and assumptions about teaching and learning, and some clear ideas and strategies regarding how one translates these into practice. In short, a critical challenge for the contemporary instructional designer choosing to adopt a constructivist approach in the design and creation of online learning environments is the integration of epistemic and pedagogical assumptions (Jonassen, 1991a) of constructivist theory with best practices. Jonassen and Rohrer-Murphy (1999) underscore this as not only a challenge, but also a practical problem because "while detailed conceptions and examples of the kinds of CLEs [constructivist learning environments] exist, less practical advice is available on how to construct them and especially how to perform the analysis phase of the design and development process for CLEs" (p. 61).

A central assumption of a constructivist approach to instructional design is that knowledge

is "a person's meanings constructed by interaction with one's environment," and that instruction entails "a learner drawing on tools and resources within a rich environment" (Wilson, 1995, p. 27). It is my opinion that an analysis of the embedded tools, tasks and resources provided is necessary to evaluate the relative richness of any constructivist online learning environments. Such analyses also provide blueprints for practice, or at least tangible examples, so often missing from discussions of applications of constructivist principles to online learning environments (Jonassen & Rohrer-Murphy, 1999). This paper provides an analysis of an online learning project, using both computer-supported learning environment (CSLE) and activity theory as conceptual frameworks, to evaluate the extent to which such could be characterized as an example of a rich constructivist online learning environment.

Computer Conferencing: A Communications Medium for a Constructivist Approach

Most definitions of constructivism include a strong emphasis on socially mediated discussion as a critical element (Bruner, 1986, 1990**;** Jonassen, 1991a; 1991b.). Jonassen, Davidson, Collins, Campbell, & Bannan Haag, (1995) claim that, under constructivist approaches, "learning is a social and dialogical process in which communities of practitioners socially negotiate the meaning of phenomenon" (p. 9). Garrison (1997) argues effectively for the use of computer conferencing as the most feasible and effective technology for achieving the ideals of a collaborative **,** constructivist approach to education at a distance, claiming that such a technology can support learners in the processes of "collaboratively constructing meaning and confirming understanding" (p. 3). Sherry (2000) adds that all computer mediated communication (CMC) systems can be described as socio-technical networks, in which the technical and social forces, such as conversation, cannot be clearly separated. She underscores the social dimension of such technologies because they facilitate, and shape human interactions and ultimately, social change. According to Laurillard (1993), the primary function of such discursive media as computer conferencing is to bring people together for discussion. Gibson (1995) claims that the real promise of these computer mediated communication tools for learning is to enable "connection to other learners and to resources within a potentially rich, discursive learning environment" (p. 8).

This paper describes the design and implementation of a collaborative issues analysis project (IAP) that attempted to operationalize, within the context of an online learning environment using asynchronous computer conferencing, the designer's constructivist assumptions and models (Gibson, 1995). An evaluation of the relative success of this initiative is presented in light of nine principles of computer-supported collaborative learning environments (Means et al., 1993). In addition, activity theory (Jonassen & Rohrer-Murphy **,**1999) and related activity centered design (Gifford & Enydey, 1999) are combined and used as a valuable conceptual framework with which to examine and evaluate the extent to which the IAP online learning activity reflects the values and principles of a constructivist learning environment. In addition, results of a transcript

analysis of one IAP group's online interactions indicated two of the relative success of this initiative, namely high levels of collaboration and active peer facilitation of discussion. An important overlay to this discussion is the fact that this online learning project was, in large part, designed to facilitate the use and development of higher order thinking skills.

The Case Study Context

Thirty adult learners (16-male/14 female) from across Canada participated in a nationally funded 18-month agricultural leadership development initiative entitled the *Canadian Agricultural Lifetime Leadership (CALL)* program. The overall goal of the program was to enable and empower graduates to provide vision and leadership to Canadian agriculture, and to assume important leadership and advocacy roles at the national level. Program objectives included: to learn about agricultural issues, to share this knowledge with others, and to improve individual leadership skills.

In addition to face-to-face delivery strategies (e.g., *Leadership, and Study Travel Seminars*)the CALL Program employed the *FirstClass*™ computer- conferencing environment for the duration of the program, which served to facilitate leadership development at a distance. To assist in achieving this goal an online learning project was designed **,** which required participants to form small working teams (3-5 members) each of which focused their activities on the analysis of a particular issue relevant to agriculture leadership. Referred to as the *Issues Analysis Project* or IAP, this learning activity enabled team members to work collaboratively within an asynchronous computer conference environment to create a coherent and detailed report concerning a key issue facing the Canadian agriculture industry.

The computer conference provided continuity between CALL face-to-face sessions and allowed IAP team members to work together despite geographic distances. For most, this was a new and challenging approach to learning. Therefore, learner support strategies were integrated into the program design (e.g., an initial orientation to the IAP task and computer conference system, the provision of an *IAP Guide*, and regular online coaching).

The Issues Analysis Project

The IAP allowed participants to apply leadership development theory to an authentic task (i.e., a real issue) in a context relevant to Canadian agriculture. The conceptual framework for the IAP was based on Ruggerio's (1988) issues analysis model which included five basic process stages whereby participants *explored* options and issues, *expressed* a chosen issue precisely, *investigated* sources of information, *produced* ideas about the issues, and*evaluated* and *refined* these ideas into a final written report and an oral presentation. Guidelines for the selection of issues to analyze required that they be nationally significant, somewhat controversial, and reasonable in scope, and that evidence be available.

The aforementioned *IAP Guide* provided a step-by-step process outlining the IAP stages, procedures, associated timelines, and products for each stage. This gave participants a quick summary of what they needed to do, and by when. The IAP processes and product

challenges for each stage are briefly listed in Table 1.

Table 1.
IAP process and product by stage.

IAP Stage	Team Process and Product Challenge
Exploration	within a stated area of interest, teams identify an issue
Expression	create a written statement summarizing the issue, its importance, and manner in which the analysis is to be conducted
Investigation	use a variety of research methods to gather evidence and reports on sources
Idea production	enter into the production of ideas via summarizing, analyzing, synthesizing, and compiling evidence
Evaluation/refinement	create a final written and oral report describing the issue, outline evidence, state your position

Additional information was included that helped guide teams in their approaches to thinking about the issues. A sample of question prompts for each IAP stage is shown below in Table 2.

Table 2.
Sample question prompts for each IAP stage.

IAP Stage	Holistic Thinking Challenge: Sample Questions and/or Prompts
Exploration	Why is this issue as it is and not as it should be?
Expression	What is the essence of the issue?
Investigation	How have you extended your information sources?
Idea production	What techniques will you use to generate good ideas?
Evaluation/refinement	What are your central ideas, your fundamental stance?

An Overview of the Education IAP

The Education IAP group's transcript was selected for analysis, as their focus was most in line with the researcher's interest and background. In addition, this group actively and effectively used the computer conference space to complete the various stages of the IAP. A brief overview of the Education IAP processes, themes and foci for discussion evident within the online transcript is presented below.

During the *exploration* stage of the IAP, the group spent considerable time discussing the issue of education in agriculture in the broadest sense possible. As Ruggerio (1988) suggests, this process was stimulated by "discontentment" with the status quo (p.35). These discussions ranged from the perceived lack of agriculture education in the public school system, to the relative ignorance of urbanites regarding the importance of agriculture, to misguided corporate and political policies that reveal a general lack of awareness of the human and economic impacts on agriculture. The need for an increased emphasis on training employees to meet current and future agricultural demands was an additional topic explored.

The group next moved to the second stage of the IAP, further articulating the above topics into a formal *expression* of the issue. Following the suggestions laid out by the *IAP Guide*, the group "determined the essential elements of the issue and expressed them in writing" (Ruggerio, 1988, p. 35). This statement, posted and shared with the wider CALL group, was to form the Education IAP's general framework for the succeeding stages, and provided the structure for their final written report.

The third stage of the IAP was *investigation* and the task for the group was to determine what information was necessary or helpful and what evidence was relevant to the issue, and then obtain that information or evidence. Ruggerio (1988) claims that this phase of an issues analysis process is "especially important in dealing with complex and controversial issues" (p.35). Efforts were taken by the group to determine the background of the issue, the various viewpoints involved, and the different lines of reasoning that have been or could be advanced. In line with Ruggerio's recommendation, the Education IAP group consulted three sources of information to investigate the issue—*themselves*, *peoplearound them* , and*authorities* . The participants consistently shared their personal perspectives and interpretations, based on their considerable collective experience in agriculture. They also regularly tapped into professional resources available to them (e.g., professional contacts). Finally, the breadth of information gathered from a wide variety of authoritative resources (e.g., government reports, books, articles), then shared and discussed with team members, was impressive.

After having spent time investigating the issue of agriculture education, the group moved to working with the general conceptual framework they had constructed and began to *produce ideas*. This fourth phase of the issues analysis process is critical as it is here that the "aim is to force our thinking out of the molds which conditioning and habit have created and consider many possible responses before embracing any" (Ruggerio, 1988, p.35). The group worked diligently at crafting a number of tenable solutions to the problems explored, expressed, and investigated within the main issue.

For the fifth and final stage of the IAP, the Education team strove to *evaluate* and *refine*their analysis of the issue. They examined, through ongoing discussion, the ideas generated in the earlier stages and identified those that seemed most reasonable. Through posting a series of iterations of the written report, the Education IAP group framed their "response to the essential elements of dispute" (Ruggerio, 1988, p. 35). This stage facilitated the construction of the final draft of their written report, the essence of which was formally presented to peers and a variety of program

stakeholders at the conclusion of the CALL Program.

The IAP, embedding cognitive tasks within collaborative processes, from initial identification and exploration of the issue, through to the final written report and presentation represents what might be considered a tangible application of constructivist principles to an online learning environment. However, the relative success of such an approach needs to be articulated in equally tangible terms; we need specific markers of success if this initiative is to receive a reasonable evaluation. A brief critique of the design of the IAP online learning activity, in light of the goals of Computer Supported Collaborative Learning (Means, et al, 1993), and Activity Centered Design principles (Gifford & Enyedy, 1999) is presented below. Use of these two conceptual frameworks offers some measure of the relative success of the IAP, both in terms of how well it operationalized constructivist values and principles, and its utility in providing an online learning context in which holistic thinking was stimulated.

The IAP as a Computer-Supported Collaborative Learning Environment

Sherry (2000) claims that Computer-Supported Collaborative Learning (CSCL) is an emerging paradigm of education that emphasizes a melding between individual cognitions and socially shared representations**,** developed through ongoing discourse and joint activities that take place within a learning community. Put more simply, the community learns from its individual participants, and each individual learns from the community**:**powered by the engine of cognitively engaging discussion, a functioning, dynamic learning *system* is created. Typically, CSCL environments incorporate CMC tools to facilitate communication among all participants for the purposes of developing shared knowledge and understandings.

According to Sherry (2000), one of the contributing foundations of CSCL is based on the concept of situated learning (Lave & Wenger, 1991). This, and other related perspectives (e.g., communities of learners, cognitive apprenticeships) challenges traditional views on the nature of learning and cognition, and instructional design, to move "beyond the individual mind to include learning that is built up by mediated conversations among members of peer groups, local learning communities, and broader cultural systems" (Sherry, 2000, p. 21). CSCL environments often represent a process of combining particular pedagogical assumptions and then operationalizing these with the use of computer mediated communication tools. This approach demands a reconceptualization of learning from individual acquisition of knowledge and skills to learning as individual and collective engagement (Jones, Valdez, Nowakowski, & Rasmussen, 1995)**,** with relevant activities and authentic tasks embedded within and contiguous with the larger online learning community or environment.

Table 3.
A comparison of educational authentic task markers and elements designed into the IAP.

Markers of an Authentic Task Means, et al. 1993)	The Issues Analysis Project...
multidisciplinary curriculum	required participants to consult a wide variety of information sources, across a variety of disciplines.
collaborative learning	emphasized a collaborative, team effort within all phases and products
heterogeneous groupings	required that each IAP group was heterogeneous (i.e., members from different provinces, agri-food sectors, education levels, etc.)
interactive modes of instruction	used the CC component, in conjunction with face-to-face meetings, to create a system which facilitated interactivity
student exploration	emphasized exploration of the issue explicitly (as one of the stages) and implicitly as a general attitude to the project
teacher as facilitator	successfully encouraged the use of peer facilitation to complete the project; some facilitation by the CALL Program Coordinator
performance-based assessment	required a final product, namely, a formal report, representing the group's collaborative efforts of the analysis of their issue
extended blocks of time	took place over an 18 month period (the duration of the CALL Program)
all students practice advanced skills	facilitated the use and development of a variety of skills, including the use of CMC tools to conduct collaborative group work online

Given the central importance of embedding authentic learning tasks within the context of CSCLs, it is critical to ask, "Was the IAP an authentic, relevant task and how would we evaluate this?" Means et al (1993, p. 4) provides a useful set of interrelated elements or markers to describe educational authentic tasks. Following is a comparison between these markers and elements designed into the IAP.

An additional element identified by Lave & Wenger (1991) indicative of a situated learning context is the linking of students with a community of practitioners. Interestingly, within the IAP, and the computer conferencing system used as a mediating tool of the CSCL environment, this community of practitioners was not external to the group, but rather evolved internally, through continuous online dialogue and resulting refinement of their works-in-progress. In this sense, as the IAP progressed each member of the IAP group moved from tentative, naïve participation to a more expert status within a community of practice.

In light of this brief analysis, the IAP appears to fit the description of an authentic task operating within the context of a CSCL environment. The computer conference environment, as a mediating tool, enabled participants to share distributed ideas and representations of the issue/s to overcome the confines of individual, and therefore limited, perspectives on the topic. Finally, the design of the IAP obviated the necessity for anyone to adopt the role of instructor; instead, peer facilitation and coaching were the

norm.

The IAP as an Activity System Reflecting Activity Centered Design

Engestrom (1996), drawing on earlier work by Leont'ev (1981), views all human activity as contextualized within an interdependent activity . *system* . Applied to the analysis of learning activities, according to Jonassen and Rohrer-Murphy (1999) and Sherry (2000), this activity system usually consists of at least six elements. Following is a brief analysis of the IAP as an activity system using the essential elements of the activity theory framework provided by Jonassen and Rohrer-Murphy (1999).

Step One: Clarify the Purpose of the Activity System.

The IAP was designed as a relevant online learning activity placed within the larger context of the goals of the CALL Program. There was an expectation that this ongoing activity would enhance participants' understanding of the role of leadership as it impacts issues of relevance to Canadian agriculture.

Step Two: Analyze the Activity System.

Analyzing the activity system includes defining the subject/s (or actors), the relevant community/communities, and the object. In this case, the *subject* was any team member in an IAP group. The *community* of learners included all team members connected electronically who focused their activity on the problems and issues discussed under particular IAP topics. The *object* of the IAP activity included . *all* discussions exchanged within the computer conference regarding the issue under analysis, and the final report regarding their IAP topic.

Step Three: Analyze the Activity Structure.

It is important to accurately and clearly define the activity itself, preferably decomposing the activity into its component actions and operations. This was provided to the participants in the form of the initial orientation to the IAP and the conceptual framework informing it (i.e., Ruggerio's five stage issues analysis process), the *IAP Guide* described earlier, and continuous online support available for clarification of the process and product expectations for each stage.

Step Four: Analyze mediators such as tools, rules, and roles.

The primary mediating *tools* of the activity was the *FirstClass*™ network and its associated synchronous and asynchronous communication tools. A critical rule and related roles regarding appropriate social actions associated with the IAP was an expectation of full participation online (e.g., posting regularly to the IAP). This rule was translated into related roles to include individuals taking responsibility for peer facilitation of ongoing discussion, maintaining progress on the project, and collaborative contributions to the multiple iterations of the final IAP report.

Step Five: Analyze the contextual bounds, both subject and community driven.

While the IAP required some division of labour (e.g., cooperative activities), most responsibilities were shared among participants. The nature of the particular mix of talents within of any IAP team dictated contextual bounds on both the subject and community levels. For example, in all IAP groups, one individual took on a leadership role (e.g., maintaining appropriate pacing through the IAP stages). Others would bring their research talents to various stages of the IAP (e.g., exploration and investigation). The overarching contextual boundary was the CALL Program itself, its other learning strategies and processes, and its primary focus (object) being leadership development.

Step Six: Analyze the Activity System Dynamics.

Here the focus of the analysis is on the interrelationships that exist within the various components of the activity system, including how they change over time. It is clear that within the online IAP activity system, the aforementioned five elements were indeed dynamically interrelated. Taking "mediating tools of the activity" as an example, as participants gained experience with the computer conferencing tools, including the synchronous chat tool, the approach to using these tools for the IAP shifted from mild apprehension to enthusiastic engagement with the technology. In turn, this increased comfort with the medium undoubtedly influenced the ease and efficiency with which discussion took place regarding the various issues and topics under study. In addition, analysis of the online transcript showed that as participants grew more experienced with the medium (over time) it was consistently used to not only work on IAP tasks, but to build a sense of community. This finding is in line with Hewitt, Scardamalia, and Webb (1997, p. 4) who claim that "changes in the design *[or use]* of a tool may influence a subject's orientation toward an object, which in turn may influence the cultural practices of the community." There were many other examples where one could trace particular elements in the activity system influencing another element, and therefore, the nature of the entire activity system.

This view of the *dynamic* nature of online learning activities such as the IAP, as they are embedded within a CSCL environment, recognizes that socially distributed human activity (e.g., discussion) interacts with and influences the nature and transformative potential of the larger activity system itself. Thus, when analyzing any learning activity (e.g., IAP) as a way of enhancing teaching and learning one must consider its effects on the entire learning system into which it is introduced, including the individuals who comprise it, the tools they use (and the conventions of their use), the products and performances they create, the roles and responsibilities of individual group members, and the meanings they share as a learning group (Engestrom, 1996). Likewise, when analyzing online technologies (e.g., CMC), in an educational activity *system* such as the IAP, evaluating these primary mediating tools of social discourse needs to be considered in light of not only the level of connection participants have with each other **,** but how this connection translates and transforms a wide variety of information resources collaboratively gathered, shared, and worked with. As such, a CMC tool like computer conferencing is not simply clipped on to a learning activity, but rather, is seen to transform it (Tikhomirov, 1981).

Conclusion: Constructivist CSCL Environments for Holistic Thinking

Chism (1998, pp.7-8) claims that CMC can be used for a number of purposes. In my view, these purposes can be listed sequentially, but must be understood to interact simultaneously in a CSCL environment supporting constructivist principles. First, CMC should be used to build group coherence among learners. Only then can it provide a communications environment in which to share information via collaborative learning strategies, particularly effective in group-based project work (Collis, Andernach, & Van Diepen, 1997). CMC must then move on and provide opportunities for the processing of ideas by creating an online community within which students elaborate on discussions or continue to deal with unresolved issues. Finally, CMC must facilitate the refinement of process skills such as communication, critical thinking, and creative thinking (e.g., engage learners in collaborative problem solving). Of course, the mediating tool of CMC does not make all this happen. Rather, it is the design of the entire CSCL environment, the learning activities embedded within the environment, and the intelligent use of CMC tools that operationalize such goals.

It is my opinion that the learning tasks or activities embedded within CSCL environments cannot be treated as atomistic phenomena, as it might be under a domain-centered, or even student-centered instructional design approach (Gifford & Enyedy, 1999). Rather, drawing on the precepts of activity theory and following an activity centered design considers the online learning activity to be a holistic phenomenon, influenced by a complex variety of contextual and process factors, all dynamically interacting and transforming the particular CSCL environment.

Finally, as in the case of the design of the IAP described above, other factors may need to be considered when analyzing the design of an online learning activity. For example, one of the underlying purposes of the IAP activity, and embedded within the activity structure, was that it attempt to stimulate holistic thinking (content-basic, critical, creative, and complex thinking) (Iowa State Dept. of Education, 1989) and by extension, deep learning (Evans & Honour, 1997). These goals are not uncommon sentiments among educators and are likely critical considerations and hoped for outcomes in the design of constructivist online learning activities and environments. Research exclusively concerned with describing cognitive changes assumed to occur within the individual *independent* of contextual influences such as the IAP learning activity described above, can only hope to tell part of the story (Bullen, 1998). Findings indicating that cognitive skills fluctuate as a function of the situation, suggest that thinking skills, per se, are limited in their generality and that "*context* is an integral aspect of cognitive activities and events, not a nuisance variable" (Rogoff & Lave, 1984, p. 1).

Higher order thinking can thus be seen as intricately interwoven with the problem to be solved or issue to be analyzed and the learning to be realized, with the context in which all are situated. Context here includes the physical and conceptual structure of the learning environment, the purpose of the activity, and the social milieu in which it is embedded.

From a research perspective, one must attend to the content *and* the context of intellectual activity in order to understand phenomena such as holistic thought processes underlying deep learning. In other words, understanding the detailed circumstances and influences of cognitive activity, including context, is essential to developing a more sufficient theory of holistic thinking development and deep learning. A broader view of context was taken in the case of this study, the IAP within CSCL environment, required that "task characteristics and cognitive performance be considered in light of the goal of the activity and the interpersonal and cultural context in which the activity is embedded" (Rogoff & Lave, 1984, p. 4).

Coming round full circle, central to the online learning context, the technical and process milieu in which a variety of cognitive activity occurs, is the assumed interaction with other people and the use of socially provided tools and schemes for discussing issues and solving problems (Woods, 1994). In the context of the IAP, the cognitive activity or thinking was*socially* defined, interpreted, and supported in and by the CSCL environment. Participants in this CMC environment, in conjunction with each other and guided by implicit, and sometimes explicit, social norms set goals, negotiated appropriate means to reach the goals, and assisted each other in implementing the means and resetting the goals as activities evolved (Rogoff & Lave, 1984, p. 5). The individual members of the Education IAP and the social milieu of learning of the CSCL environment interacted over time to strengthen and transform one another in a reciprocal spiral relationship (Salomon & Perkins, 1998).

Addressing the application of the apparent contrasting perspectives of traditional ISD vs. a constructivist approach to the challenges of creating online learning environments, Yarusso (1992, p. 9) states that he would use the former when faced with a need to be productive and the latter when faced with a need to be creative. This view seems unnecessary (Gibson, 1995), too simplistic, and underlines a false dichotomy between thinking and doing. Alternatively, Barell (1991) talks of creating a learning climate wherein learners feel invited to think productively. He calls this kind of environment invitational, wherein learners feel comfortable expressing their ideas, do not fear being wrong, are willing to challenge established points of view, and can risk asking, "What if?" and "Why not?" (Barell, 1991, p. xiii-xiv). In my view, at least two necessary design elements are required for the creation of such an *invitational* constructivist online learning environment: 1) the creation of online activities reflecting basic principles of computer-supported collaborative learning, and 2) that an activity-centred design process be followed.

Finally, activity theory holds promise as a useful conceptual framework with which to analyze and evaluate the relative success of CSCL environments and embedded learning activities regarding the extent to which these are reflective of constructivist values and principles. However, more research is needed to further articulate how such a framework can be translated into specific design approaches for the development of wider variety constructivist online learning environments. This article has added to that research by providing a retrospective analysis of one online learning activity, namely, the CALL

Program's *Issues Analysis Project* , framing that analysis within CSCL principles, and using activity theory as a conceptual framework for evaluation.

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