Using the Web to Support Inquiry-Based Language Learning

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Abstract: Peirce's idea (1868) of a community of inquiry is more relevant today than notions of an invariant curriculum or conventional modes of instruction. In order to foster such a community, we have employed web-based communication and knowledge-building tools such as the Inquiry Page *http://inquiry.uiuc.edu, through which users can create modifiable representations of ongoing stages of inquiry called Inquiry Units. For example, teachers can represent the initial stages of inquiry in a Unit, which is then spun-off by students as they continue the inquiry. This process blurs the line between curriculum development and student work and between teacher and student in a way that is more productive for future work and learning. The web-linked Inquiry Units thus enable a tangible form of a community of inquiry and provide insights for future development of web-based resources.*

Students today encounter rapidly changing technologies and information resources, as well as the need to understand a complex global society. Yet the traditional modes of learning are often inadequate for coping with these changes or building upon the students' diverse and rich personal backgrounds. Moreover, these modes are poor models for the collaborative inquiry and reflective practice (Schon, 1983) that people need as they engage with others in their roles as students, citizens, and productive members of society.

In this paper, we discuss inquiry-based learning as a philosophical and pedagogical response to the changing needs of the information age. We then present the *Inquiry Page*, which is simultaneously a website, a community of learners, and a research project. Third, we discuss various ways that the *Inquiry Page* supports inquiry-based language learning.

What is Inquiry-Based Learning?

Traditional curricula in most countries have emphasized a delivery of content approach. Knowledge is assumed to exist, or be encoded within texts. The role of the teacher is to manage the delivery of this knowledge and the role of the learner is to absorb as much as possible. More specifically, students are expected to master certain basic learning skills, such as to:

- Solve problems
- Remember the textbook
- Follow directions
- Work alone
- "Cover" the curriculum

Whether such a pre-set curriculum and approach to learning were ever fully adequate is debatable. But in today's rapidly-changing world it is clear that they are not. Students today need to learn much more than the knowledge written in a textbook. Instead they need to be able to examine complex situations and define solvable problems within them. They need to work with multiple sources and media, not just the single textbook. They need to become active learners, and to collaborate and understand the perspectives of others. In short, they need to learn how to learn; to learn how to:

- Ask: Find problems
- Investigate: Multiple sources/media
- Create: Engage actively in learning
- Discuss: Collaborate; diverse views
- Reflect: Learn how to learn

Thus, there is a shift from a transmission-oriented pedagogy to a more open, inquiry-based mode of teaching and learning. The value of inquiry-based learning is now widely recognized (Bruce & Davidson,1996; Minstrel & van Zee, 2000; Wells, 2001). For example, the US National Science Foundation asks for "research-validated models (e.g., extended inquiry, problem-solving)." The (Carnegie Foundation's) Boyer Commission on Educating Undergraduates in the Research University (1998) sets as its number one priority, to make research-based learning the standard. Project 2061 of the American Association for the Advancement of Science has as its number one goal, "science literacy for all high-school graduates", by which they mean developing the broad, critical perspective and the habits of mind that develop through scientific inquiry.

## Diversity of Learners and Disciplines of Study

All learning begins with the learner. What children know and what they want to learn are not just constraints on what can be taught; they are the very foundation for learning. For this reason, Dewey's (1956) description of the four primary interests of the learner are still a propos: *inquiry*, or investigation—the natural desire to learn; *communication*— the propensity to enter into social relationships; *construction*— the delight in creating things; and *expression*, or reflection—the desire to extract meaning from experience. Dewey saw these as the natural resources, the uninvested capital, "upon the exercise of which depends the active growth of the child." As Dewey recognized, schooling is not only about the individual, but also about the intersection of the child's interests with those of the society. The disciplines we study in school represent centuries of collective thought as well as the interests of the larger community in maintaining itself by communicating its knowledge and values to the next generation.

Newcomers to a field of inquiry are often frustrated by the gap between their ordinary experience and the codified knowledge of a discipline of study. In the field of education, for example, many have trouble connecting what they know of their own learning processes, or the experiences from their own

teaching, with the canonical articles and theories they are given in university courses. Dewey argues that this gap is enlarged when we reify disciplinary knowledge, viewing it as static, and constructing it as different in kind from the knowledge we gain through daily living. If instead, we could see the disciplines as representing the ongoing processes of a community of inquiry, then the conflict between personal, situated knowledge, and historically-constituted, communal knowledge becomes a problem of melding and connecting, not of choosing one over the other.

Learning as Process

A key idea for inquiry-learning is that there is a cycle or spiral of inquiry. Rather than thinking of knowledge as static and the learner as an empty vessel whose job it is to absorb as much as possible of that pre-defined material, the learner is viewed as an inquirer, learning through work on meaningful problems in real situations. The figure below places the primary interests of the learner in the framework of a cycle of inquiry (Bruce & Davidson, 1996). For any question or problem, one may then think of activities of asking, investigating, creating, discussing, and reflecting as means for its resolution.
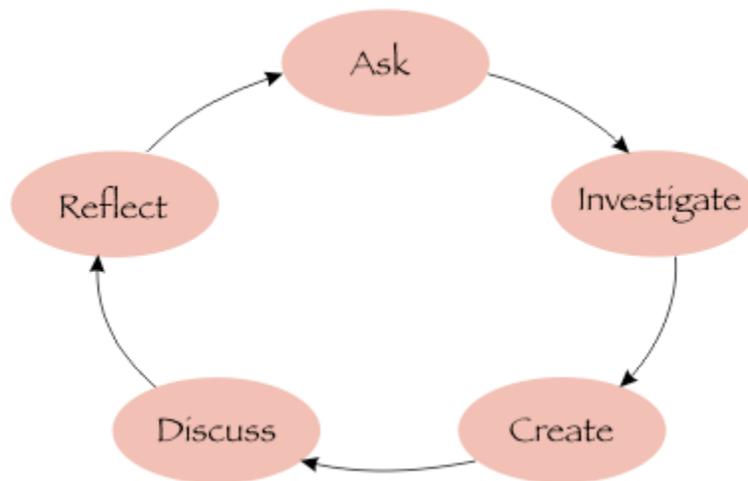
Communities of Inquiry

In the area of language learning, there is now a diverse array of efforts aimed at creating curricula that put the learner first. These models also emphasize the essential nature of participation in a community of inquiry. For example, Berghoff, Egawa, Harste, and Hoonan (2000) ask what schools would look like if they operated on the assumption that literacy involves a full range of interpretive abilities, not only the capacity to use language, narrowly defined. Their work assumes that learners who are making meaning draw on different dimensions of knowing—different forms of expression, different kinds of ideas, and different cultural frameworks. By recognizing and honoring these differences in the classroom, the school can create a richer way to explore the path to knowledge.

Short, Harste, and Burke (1995) talk in a similar way about creating classrooms for authors and inquirers, in which reading and writing are seen as integral to processes of learning about oneself and the world around. Short, et al. (1996) show how an integrated curriculum emerges from a view of learning and language united through inquiry processes. Wells (2001), and Wells and Chang-Wells (1992) have also developed models showing how the inquiry process reveals deep connections among

classroom activity, learning, and language. Bruce and Easley (2000) talk about the need for communities of inquiry to support teachers as they attempt to foster more inquiry in the classroom.

It is crucial to recognize that a successful "community of inquiry" is not one in which everyone is the same, but instead one that accommodates plurality and difference. Clark (1994), for example, considers different ways this accommodation can occur. In some cases, it compartmentalizes differences or establishes a hierarchy of one set of values and ideas over others. It can exclude, as well as include, people and ideas. Clark argues (p. 74) that we should focus on maintaining equitable relations first, and then consider collective tasks:

> [This] renders the progress of expertise in a community secondary to a relational and epistemological practice of confronting differences so that its participants can come to understand how the beliefs and purposes of others can call their own into question. With this as its primary practice, the project of maintaining community can accommodate both equality and difference.

Differences among participants in the inquiry community can thus have different consequences, depending on how they are addressed. Productive work emerges when differences are not subsumed into a larger order, but rather understood through a hermeneutic process. A challenge for the community is to maintain a focus without denying individual experiences, perceptions, and values.

Research Questions

Some of the research questions that emerge from an inquiry perspective on learning are these:

- How do we bridge across sub-communities and disciplines, recognizing the diversity of each learner?
- How do we promote the process of inquiry at all levels and for all participants?
- What tools and procedures best support a community of inquiry?

We are addressing these questions in the context of a project we have developed and a set of tools we are now using and studying, called the *Inquiry Page* http://inquiry.uiuc.edu/.

The Inquiry Page

The *Inquiry Page* (http://inquiry.uiuc.edu/), is about how teachers weave a learner's interests with those of society. It does this by supporting teachers as they share their successes and their collective expertise. The project is simultaneously a website, a community of learners, and a research project. There is an active web site that serves approximately one million page views per year. In addition, there are weekly meetings and a wide range of workshops and conferences. It is also the locus for research, promoting the idea that even its own structures and beliefs need continual re-examination.

The *Inquiry Page* currently supports teachers and learners of all ages and curricular areas. It is a web site for collaborative curriculum development through the creation of Inquiry Units. The Inquiry Units become starting points for student inquiry, through which they are encouraged to ask questions, investigate, create, discuss, and reflect. Among the uses are the following:

- Present problems for researchers
- Demonstrate how research results can be used
- Support the integration of knowledge across a community of inquiry
- Provide a means for all students to collaborate and learn from one another
- Support development of an active digital library
- Document the learning process
- Articulate lesson plans that are more open-ended and student-centered

Teachers are also learners in this process, both about phenomena in general and about the processes of teaching and learning. They inquire through their access to resources on teaching and learning, including quotes about inquiry teaching, articles, project links, curriculum units, and content resources; they communicate with other teachers through various online communication media; they construct their own versions of curricula using the online Inquiry Unit generator; and they reflect on teaching and learning experiences as they share both literal and textual photos of their classrooms through these Units.

A key concept throughout is that the processes of creating, using, and critiquing the site and the resources within it should exemplify the open-ended aspects of inquiry and social participation that the site itself is encouraging. We hope that participants will learn about the tools and the development process as they construct resources they can take away with them. Moreover, we invite them to join in the collaborative process of developing the *Inquiry Page*.

Some Elements of the Inquiry Page

The *Inquiry Page* contains a variety of resources. These have evolved through interactions with different user communities, each seeking different ways to represent ideas about inquiry and curriculum:

- Quote of the Day: A collection of writings on teaching and learning, with a special emphasis on those that expand our conception of what learning can be.
- Links to Resources: A dynamic incorporation (using Digital Windmill) of the Open Directory category: Reference: Education: Learning Theories: Inquiry Based Learning. This category is edited by the *Inquiry Page* development group.
- Inquiry in Action: A section in which teachers can show what inquiry looks like in their classrooms, or researchers can show their own processes of inquiry. It includes photos, video, text descriptions, and links to Inquiry Units.
- Evaluating Inquiry Instruction: A web page linking to articles, presentations, and other resources regarding the special issues of evaluating inquiry-based learning.
- Inquiry Units: A searchable data base of Units for inquiry-based instruction across grade levels and subjects.
- Inquiry Partners: A growing collection of partner projects, courses, and schools.

Collections Policy

The project has followed a somewhat unusual path with regards to developing policies related to building and managing content on the *Inquiry Page*. We can describe what is going on with the

collection of material on the site from the perspective of either "publishing" or library "collection development" perspectives. In publishing online material, many other educational sites have review committees, selection procedures, and rankings to separate the good from the bad. Libraries have their own traditional procedures and policies. They typically proceed through a cycle of assessing the needs of their intended community of users, developing criteria to govern their identification and acquisition of material to meet users' needs, evaluating the relevance and quality of material, and determining procedures for evaluating material and removing that which is no longer needed. There's certainly a value to both website publishing and library approaches to building collections of useful material. With the *Inquiry Page*, we're working on mechanisms now to piggy-back on what others have done in the realm of setting collection policy.

At base, we are starting with questions such as:

- Who are the audience(s) for the site and what are their needs?
- What controls should be placed on who can contribute content and what form that content should take?
- Do we need to assess the quality of Inquiry Units added to the site? Develop criteria governing the inclusion of material?

Situating collection decisions in use, we've taken the position that no Unit is ever really finished and unambiguously good. Even a very good Unit needs to be adapted to fit particular students, local resources, etc. Also, even an incomplete Unit might be very useful for some purposes or when complemented by a text or other activities. We also see value in being able to share inquiries in progress, whether they are about a science question, a community problem, or a way of teaching.

Inquiry Page policies tend not to dictate or exclude users and creators of Units, but rather support the ability of people to identify, evaluate, and modify Inquiry Units to suit their own situation of use. So, instead, we use tags such as *Public/Private, Ready-to-Use/Not-Ready-to-Use*, and keywords as a way to indicate the status of a Unit. Also, Unit authors can easily put in their own text to describe a Unit's status. For example, we could say in the *Background* section, "this Unit is under development" or "We're trying to put together some good resources for a Unit, but it's not ready to be used in the classroom without some additional effort." If development of the *Inquiry Page* is proceeding through use, we don't want to prescribe or predetermine uses, but learn through the diversity of uses.

Design and Evaluation

The *Inquiry Page* is developed through a process of *participatory design*. Users contribute to all of the various resources on the site, but more importantly, are designers. They do this through email and bulletin board discussions, weekly discussion sessions, and through workshops. Participants in this process include K-12 teachers, museum educators, librarians, university students and faculty, and others engaged in a variety of lifelong and informal learning activities. Rather than promoting a particular conception of learning, the site encourages a process of inquiry about teaching and learning and about how technology can best support it.

The project aims to respond to human needs by democratic and equitable processes. The users are the developers, through their creation of the site content, their contributions to the interface, and their

evaluations, often simply by discussion within the inquiry community of its usefulness, reports of what works and what does not in the context of their own settings of use. Workshops on *Inquiry Page* use conducted in a wide variety of settings, from academic conferences to small local settings of potential use, are one type of focused evaluation activity that is serving design through use quite well. Such workshops offer a window into use that helps anchor further design of inquiry-based learning technologies (social and digital) in authentic experiences, while stimulating creative extensions.

Studies of the *Inquiry Page* use *situated evaluation* as a way to take into account the fact that actual use is an interaction between specific, local circumstances and the introduction of new tools and ideas:

> Situated evaluation is a "new framework for understanding innovation and change. This framework has several key ingredients: It emphasizes contrastive analysis and seeks to explore differences in use. It assumes that the object of study is neither the innovation alone nor its effects, but rather, the realization of the innovation—the innovation-in-use. Finally, it produces hypotheses supported by detailed analyses of actual practices. These hypotheses make possible informed plans for use and change of innovations" (Bruce & Rubin, 1993, p. 215).

These evaluations tend to be formative and forward-looking, with the goal of improving future practice. Current interactive tools on the site for evaluation include a feedback form with automatic posting of feedback results. Inquiry participants also use methods such as case studies and participant observation to assess the use of the site as a whole and of Inquiry Units to meet specific needs. Results of these evaluations feed back into the site design and are also represented in articles about the project. Consider several examples:

- When a group of women in the community decided to use the site to address their need to take control of their health needs and to obtain better information, they responded that the emphasis on grade levels and school subjects was not appropriate for their community-action project. We found a way to change the presentation of the units so that grade levels and school subjects were not so prominent. We are also now working on a *style sheet mechanism*, which should allow customization across other projects.
- When we conducted workshops for the Missouri Botanical Gardens's users told us they wanted to include multiple web site links in their Units. This led to the idea that we had to have *live URLs*. After adding that feature, other users asked for full HTML support. Today the site can be used by anyone without any knowledge of HTML, but the users who do know it can add functionality to their own Units.
- Initial groups of middle-school teachers who used the site realized that their students could be users and Unit creators as well. They wanted a way to initiate a Unit and then have students continue the investigation. This led to the idea of *spin-offs*, in which one user can build on the work of another. Since then, other users have considerably expanded the ranges of uses for spin-offs.
- As the Units came to be used more in courses, instructors began to ask for a *comment* feature. That was added, and now, other students as well as the teacher can add their comments to each others' Units.

Examples such as these are common in the development of any new web site, but have been even

more evident for the *Inquiry Page*, because of its assumption that user knowledge is necessary to create a useful site.

Inquiry Units

A major activity of the *Inquiry Page* is to foster the online creation of Inquiry Units by teachers (or students). Each Unit starts with a guiding *Question* and provides a space for activities of *Investigation, Creation, Discussion*, and *Reflection*. These activities are often conceived as part of the inquiry cycle, giving structure to some important aspects of inquiry that might be supported in a successful learning environment. In order to create a Unit, the user fills out a web-based form that leads to an XML-formatted data structure. When the Unit is called up again by the same, or another user, a dynamic HTML file is generated.

Inquiry often leads to new ideas, results, theories, and questions, which can be communicated with others. This communication is central to the whole inquiry process. To facilitate this, Inquiry Units are indexed by user-generated keywords, grade level, subject area, or partner projects. In addition, users can indicate whether the Unit is *public* or *private*, *ready to use* or *not ready to use*, *open to comments* or *not open to comments*, and whether their email address is to be shown on the Unit. These tags can be used by other users as they search for Units. Once a Unit is located, it can be used as is. The user can also do a *spin-off* to modify the Unit to fit local purposes. Students can spin-off a copy of the teacher's Unit describing a course module or assignment, thus using the curriculum Inquiry Unit as a starting place for their own work.

Inquiry Units are being used in a variety of ways in teaching and learning about language arts. They are created by teachers for classroom activities that span educational levels from pre-kindergarten to graduate school. Students create Inquiry Units to fulfill course requirements or pursue extracurricular goals. Librarians create Units to facilitate the use of educational resources by both teachers and students. Community members are creating Units that help them achieve their personal goals as they pursue learning outside of the classroom context. Presented below is a sample of Inquiry Units that represent the range of educational activities tied to language arts in a variety of use settings:

What are the processes and consequences of electronic publication?
Chip Bruce
http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u10325.xml

> This simple Unit serves as one section of a syllabus for an undergraduate course in new literacies. It presents students with readings associated with one week of the course.

What directions do children's interests take in story reading as inquiry?
Sylvia Steiner, Linda Chu
http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u10024.xml

> Two kindergarten teachers present the lesson plans they used over a two-month period as they developed inquiry-based activities revolving around the well-known children's book by Norton Juster called *The Phantom Tollbooth*. Notable is their candid reflection

throughout the Unit on the process and results of their work.

What does hatching chicks have to do with language arts?
Pat Brown
http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u10010.xml

>Language arts activities—charting and graphing, spelling and writing, and receptive/productive language activities—associated with a chicken egg hatching program are described in this Unit.

Poetry as play
Sharon Comstock
http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u10225.xml

>A librarian created this Unit to describe how she used the concept of exploratory play with children in grades 3-5 to guide them in the production of their own book of poetry.

What library and information services are provided for librarians serving the Latino community? How can we present these in the form of a website to librarians and other information professionals?
Yanira Vegerano and Heather Booth
http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u10279.xml

>In this Unit, two students in a graduate course in the field of Library and Information Science describe and present a website they created called *A Librarian's Guide to Latino Services*. The website includes resources, from a brief description of the sociocultural basis of Latino heritage to a bilingual dictionary of computer terms to lists of award-winning multicultural children's books—intended to help librarians create a library environment that better serves the Latino community.

What sort of selection policy would be appropriate for developing a 'zine collection?
Masha Barabtarlo
http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u10944.xml

>A graduate student in Library and Information Science created this Unit to fulfill a class assignment. The assignment called for her to develop a library policy statement related to building a collection of information resources for some particular audience. Along with policy statement itself, this Unit describes the nature of Internet 'zines as a new writing medium and pulls together a set of readings related to zines.

How can a former language arts teacher utilize his or her experience in a library science career?
Natalie Bromann
http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u10596.xml

>This Unit represents a line of personal inquiry that a graduate student started at the beginning of the first course she took in Library and Information Science. She followed

it up by completing Units for later course assignments that themselves helped her answer her original guiding question: Module III: How can one create an evaluation scheme for web sites focusing on books for junior high students? http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u11120.xml and Module IV: How can one create a pathfinder to aid students in literary reports? http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u11345.xml

Create Your Personal SisterNet Spiritual Health Plan
Arlene Anderson
http://www.inquiry.uiuc.edu/bin/update_unit.cgi?command=select&xmlfile=u10905.xml

> With this Unit, a local community member participating in a workshop on computer use as part of a spiritual health seminar for the general public learned about relevant web resources in the context of writing a personal spiritual health plan.

What we find intriguing is how Inquiry Units play a role in helping people cross boundaries that can hamper inquiry-based learning in practice. For example, Vegerano and Booth's Unit demonstrates the movement of learners to teachers; the many comments attached to their Unit by practicing librarians demonstrates that what was a learning experience for them resulted in a product that librarians in the field found immediately useful. We see that boundary spanned in the other direction by Steiner and Chu. Their Unit makes explicit their efforts to learn about inquiry-based pedagogy as they implemented inquiry-based activities in their kindergarten classroom. It also blurs the boundary between educational genres because it integrates a lesson plan with sustained reflection on it. We also see boundaries crossed between academic disciplines (between science and language arts in Brown's Unit), and between professions (between teachers and librarians in Comstock's Unit). Finally, the boundary between reading and writing in new media is crossed in Andersen's Unit.

What allows this important crossing of boundaries? One important characteristic of Inquiry Units is that they situate the educational artifact in use. By completing a set of Unit template fields (including, for example, *Rationale* and *Reflection*) the situation of use is described and discussed in a way that facilitates its adaptation by others.

Conclusion

Much of the work on new media for education represents a melding of the learner and the discipline as framed by inquiry-based learning. It does that in part by the fact that, as a relatively new field of study, it does not privilege a limited or static conception of its key ideas or even of its own boundaries. Its communal knowledge bears a complex relationship with that of the individuals in the community, but it does not stand apart, promoting rigid hierarchies of knowledge. Going along with this, the social relations in the community tend to be supportive and constructive. People see themselves as valued for their own experiences and perspectives even if they are new to the community. Old-timers find that their own inquiries remain fresh because of this openness. Thus, the community processes model this melding of the learner and the discipline. At the same time, the object of study is essentially how new information and communication technologies promote the very

same processes in contexts of teaching and learning, the workplace, and other social realms.

In the case of the *Inquiry Page*, we see a similar dual role for inquiry. That is, the project is devoted to fostering collaborative inquiry among students, teachers, and community members. To do that, it offers web-based tools, face-to-face meetings, research, and evaluation. At the same time, there is no recipe for either inquiry learning or for how to support it. Thus, the project itself exemplifies the very processes it seeks to support.

References

Berghoff, B., Egawa, K. A., Harste, J. C., & Hoonan, B. T. (2000). *Beyond reading and writing: Inquiry, curriculum, and multiple ways of knowing*. Urbana, IL: National Council of Teachers of English.

Boyer Commission on Educating Undergraduates in the Research University (1998). *Reinventing undergraduate education: A blueprint for America's research universities*. [online: http://notes.cc.sunysb.edu/Pres/boyer.nsf]

Bruce, B. C., & Easley, J. A., Jr. (2000). Emerging communities of practice: Collaboration and communication in action research. *Educational Action Research, 8*(2), 243-259.

Bruce, B. C., & Davidson, J. (1996). An inquiry model for literacy across the curriculum. *Journal of Curriculum Studies, 28*(3), 281-300.

Bruce, B. C., & Rubin, A. D. (1993). *Electronic Quills: A situated evaluation of using computers for writing in classrooms*. Hillsdale, NJ: Lawrence Erlbaum.

Clark, G. (1994). Rescuing the discourse of community. *College Composition and Communication, 45*(1), 61–74.

Dewey, J. (1956). *The child and the curriculum & The school and society*. Chicago: University of Chicago Press. (Original works published 1902 and 1915)

Minstrell, J., & Van Zee, E. H. (Eds.) (2000). *Inquiring into inquiry learning and teaching in science*. Washington, DC: American Association for the Advancement of Science.

Peirce, C. S. (1868). Some consequences of four incapacities claimed for man. *Journal of Speculative Philosophy, 2*, 140-157.

Schon, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic.

Shavelson , R. J., & Towne, L. (Eds.) (2002). *Scientific inquiry in education*. Washington, DC: National Academy Press. [Online: http://www.nap.edu/catalog/10236.html?ea_49]>

Short, K. G., Harste, J. C., Burke, C. (1995). *Creating classrooms for authors and inquirers: Second Edition*. Portsmouth, NH: Heinemann.

Short, K. G., Schroeder, J., Laird, J., Kauffman, G., Ferguson, M. J., & Crawford, K. M. (1996). *Learning together through inquiry: From Columbus to integrated curriculum*. Portland, ME: Stenhouse.

Wells, G. (2001). *Dialogic inquiry*. New York: Cambridge University Press. [ISBN: 0521637252]

Wells, G., & Chang-Wells, G. L. (1992). *Constructing knowledge together: Classrooms as centers of inquiry and literacy*. Portsmouth, NH: Heinemann.