A Study of a Three-Dimensional Action Research Training Model for School Library Programs

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This is a detailed review of an in-depth action research training model and an investigation of how that model, supported through virtual and personal guidance from an academic researcher, served to impact the instructional practice of a small sample of school library media specialists (SLMSs). The researcher operates in the third dimension, simultaneously collecting data and mentoring SLMSs who function in the first dimension as designers and implementers of authentic learning tasks (ALTs) and assessments, and in the second dimension as Practitioner Researchers (PRs) who develop and implement their own action research projects. As the Mentor Researcher (MR) guides SLMSs through formulating research questions, outlining proposals, constructing theoretical frameworks, collecting and analyzing data, and presenting findings, she explores how the elements of the three-dimensional model are working. The researcher collects data from e-mail transactions and telephone conversations, as well as from interviews and meetings during on-site visits. Content analysis of the PR's documentation of their teaching units and journals provided data for triangulation. Findings indicate that the three-dimensional model of action research can elevate the quality of action research to that of formal academic research. PRs engage in formal research that models methods for students and collaborating teachers. Interactions between SLMSs and teachers reveal underlying tensions of collaboration. The action research had a positive effect on the practice of SLMSs who developed ownership and confidence in the collaboration process as well as perception of themselves as leaders.

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Introduction

This study examines the implementation of a three-dimensional model ([figure 1](#)) over a period of one year in Londonderry, New Hampshire. The researcher used the model to train school library media specialists (SLMSs) to identify problems in their instructional

practice and gather evidence useful for the revision and improvement of instruction. In the first dimension of the model, each SLMS, called Practitioner Researcher (PR), has two roles:

- o S/he engages in authentic teaching by the design and implementation of authentic learning tasks (ALTs) and authentic or performance-based, assessments (Wiggins 1992). This method lends itself to action research because ALTs generate formative assessments that provide ongoing feedback of student progress to the instructor, which in turn are analyzed as data in the action research study that constitutes the second dimension of the model.
- o The PRs conduct an action research study using conventional qualitative methods of data collection, e.g., observation and journaling, surveys, interviews, and data analysis to determine how they can improve the instructional unit developed and taught in collaboration with a classroom teacher.

The third dimension of the model, which is the subject of this paper, is the Mentor Researcher's (MR's) formal research study that examines how the first and second dimensions of the action research model work while mentoring and guiding the PRs through the action research process as defined by the study.

The Purpose of the Study

The MR identified action research as a viable tool of evidence-based practice and addressed the question of how to best train SLMSs to improve their practice through a reflective approach. She focused the study on the following questions:

3. How will the three-dimensional model of action research work as a training model for SLMSs?
4. How will action research inform the practice of SLMSs?

The findings of the study will be applied to the methods and materials used in the training of SLMSs as action researchers and, if needed, to the model itself.

Theoretical Framework

The theoretical framework of the study rests on action research as a tool of evidence-based practice. "Evidence-based practice is where day-by-day professional work is directed toward demonstrating the tangible impact and outcomes of sound decision making and implementation of organizational goals and objectives" (Todd 2003, 7). Evidence-based practice offers six key benefits.

5. It provides evidence at the local school level that library initiatives make a visible contribution to learning, and that administrators, teachers, and parents can see the real impacts;

6. It convinces administrators and community funders that the money invested in the school library is worth it;
7. It demonstrates the teacher-librarian's commitment to learning outcomes;
8. It helps teacher-librarians plan more effective instructional interventions and information services;
9. It contributes to job satisfaction; and
10. It moves beyond anecdotal evidence, guess work, hunches, advocacy, and touting of research findings (Todd 2003).

Action research, as a tool of evidence-based practice, structures reflective practice.

What is action research?Action research is problem focused, context specific, future oriented, and aims at improvement and involvement (Hart and Bond 1995). In the literature it is well conceived in its purpose and well described in its intent. Boomer (1987, 8) defined action research as a "deliberate, group or personally owned and conducted, solution-oriented investigation." Anderson, Herr, and Nihlen (1994, 2) defined it as "insider research done by practitioners using their own site as the focus of their study ... it is oriented to some action or cycle of actions that practitioners wish to take to address a particular situation." The components of action research are reflection, inquiry, and action (Patterson and Shannon 1993). Figure 2 illustrates the recursive nature of action research as well as its essential elements.

The origins of action research are attributed to Kurt Lewin, a social psychologist whose research approach, set in social and organizational settings, is focused on social action. His work shares concepts with John Dewey's experiential learning and "the inductive scientific method of problem solving as a logic for the solution of problems in such fields as aesthetics, philosophy, psychology and education" (McKernan 1991, 8). Lewin (Cartwright 1951, 240) defined the spiraling nature of action research, similar to what is represented in figure 2: identifying a general or initial idea; fact finding; planning; taking the first action step; evaluating; amending the plan; and taking the second action step. However, McTaggart (1996, 248) cautions that it is a mistake to think that following the action research spiral constitutes "doing action research.... Action research is not a 'method' or a 'procedure' for research but a series of commitments to observe and problematize through practice a series of principles for conducting social enquiry." The application of action research in educational settings was established as a strong tradition by the work of Corey (1953), who defined action research as the process through which educators study their practice to solve personal practical problems.

Why action research? Action research has been heavily examined and often implemented with positive results that lead to improving practice. Usually such improvement involves increasing confidence of teachers in their ability to reflect on their standard practice and the potential to improve their future instructional role. Action research may help teachers (including SLMs) also gain more insight into the reasons for the various academic performance levels of their students, although not always resulting in an increase of overall student performance in an immediate, dramatic manner. Action research, as most

other tools for improving instruction, requires practice, guidance, mentoring and comparison of results over time and documentation across student populations.

Research on educational change indicates that change is more likely to occur when participants feel ownership of a problem and feel connected to the solution (Anderson, Herr, and Nihlen 1994). Action research can engage educators in examining the effectiveness of their methods when they have identified an area of concern and use the research process to gather evidence for their theses. Reflection helps PRs and MRs understand what they are currently doing, why they are doing it, whether it is what they want to do, and what they should do in the future (Patterson 1996). Reflection can identify weaknesses and strengths and validates decision-making inherent in the teaching process through the use of evidence. Reporting results of action research can provide the vicarious experiences related by narrative accounts from schools and classrooms that educators find more helpful than formal educational research (Anderson, Herr, and Nihlen 1994).

It is not unreasonable to expect that the SLMS is trained in research method and is able to use action research as a tool of evidence-based practice. Action research also has implications for the pedagogy of the SLMS.

> In order for school libraries to play a key role in the information age school, I believe there needs to be a fundamental shift from thinking about the movement and management of information resources through structures and networks, and from information skills and information literacy, to a key focus on knowledge construction and human understanding, implemented through a constructivist, inquiry-based framework (Todd 2001, 3).

Implicit in this paradigm shift from an information-centered to a more relevant knowledge-centered instructional is the teaching and application of formal research methods for students. Why? Because research is the way we build knowledge. It is at the heart of inquiry and its methods are critical to discovery. "The research assignment acts as a reporting exercise when student involvement is limited to information gathering, which is usually demonstrated by reading, taking notes, and writing a summary" (Gordon, C., 1999). Reporting has masqueraded as researching for so long that the terms are used interchangeably (Gordon 1996). In a study that interviewed ninth graders as they worked through a research assignment, students revealed that their perception of doing research was writing a grammatically correct report that was well presented and provided other peoples' answers to someone else's question. The research process was not internalized in the school library; it was perceived as an extension of classroom practice. Students talked about it as though it were a test; creativity and inquiry were not deemed part of the process, and grades were looked upon as the most important measure of success (Gordon 1996).

In a study that piloted an authentic research project requiring students to engage in data collection and analysis as well as information searching and use, students responded

positively when asked, "How was this research assignment different from what you have done in the past?" "Longer, more depth, more detailed, more demanding." Student-generated comments mentioned precise instructions, format, and regulation as an unpleasant aspect of the assignment, but the same number of comments revealed that they felt more independent. "In the past I was given full instructions on the essay. Now I had to do it by myself." When asked what the best aspect of the project was, one student wrote, "That we stood on our own two feet!" (Gordon 1999).

Comments also reflected an appreciation for the distinction between reporting and research: " I never did proper research before. It was the first real serious research I have done. It was much longer and more difficult than previous papers. It was also much more interesting and more fun as well" (Gordon 1999).

The method of authentic research promotes higher-order thinking skills and knowledge construction. It is based on the presumption, however, that the SLMS knows how to do research and how to teach students to do it. Action research develops skills that equip the SLMS to make the leap from information to knowledge-based assignments. It is especially relevant to the teaching content of librarians: it addresses information and data gathering and other aspects of the research process, and the skills students need to develop habits of life-long independent learning. SLMSs benefit from refining their own research skills, gaining confidence to replace student research assignments that are stuck in a reporting mode with guided inquiry that uses authentic research methods. Action research is a reflective process that helps to elevate the academic climate of a school as students observe their teachers as curious learners engaged in a research model that is authentic and rigorous.

In fact, action research is well-suited to studying the relationship between student performance and teaching practice, which is particularly useful in today's high-stakes testing environment. Since the process of action research targets evaluation, problem solving, and action planning, it also has potential for the SLMS in terms of program and performance evaluation.

Action research bridges the gap between theory and practice as SLMSs collect data during the course of instruction. Best practice in library instruction is rooted in the same theoretical foundations as action research: constructivism and cognitive sciences, both of which seek to understand how children learn and employ qualitative methodologies not unlike those used in action research. Action research requires the SLMS to engage in the same types of learning activities as students who are participating in authentic assessments and the attendant learning tasks (Wiggins 1992).

Figure 3 demonstrates the similarities between these methodologies. Action research and ALTs both require that learners use the tools of the expert. Action research requires the SLMS to use the tools of formal researchers while ALTs require students to use tools appropriate to the academic discipline in which the task is nested, e.g., the tools and methods of the historian, scientist, mathematician, or writer. Both the SLMSs and students are engaged in problem solving as they work toward a solution to a real-life

problem. In the process, both are becoming their own best critics, empowered by evidence to improve their practice and performance.

The collaborative nature of the classroom teacher/SLMS relationship in planning and instruction is ideal for action research. "Action research is a form of collective self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of those practices and the situations in which the practices are carried out.... The approach is only action research when it is collaborative, though it is important to realise [*sic*] that action research of the group is achieved through the critically examined action of individual group members" (Kemmis and McTaggart 1988, 5-6).

Teacher education programs use action research to promote inquiry, reflection, and self-analysis, making it a good, common, collaborative ground for SLMSs and teachers.As a professional development tool, it offers SLMSs opportunities to model the research process to their colleagues in the course of reflective practice as they refine their skills in data collection and analysis.

> Action research incorporates many of the qualities of an 'ideal' staff development program. It is individualized and can be used by a teacher at any developmental level. It assumes teachers are knowledgeable and gives them power to make decisions. It can be carried out collaboratively. It is an on-going [*sic*] process and for that reason can be more effective than a typical one-day in-service presentation. One of the more significant qualities of action research is that it puts the teacher in the position of accepting more responsibility for her (his) own professional growth (Wood 1988, 16-17).

When SLMSs incorporate action research with their teaching on a daily basis and share action research with colleagues, collaboration becomes an opportunity for professional development. "As instructional colleagues, library media specialists are strategically positioned to assume a leadership role in curriculum reform" (Harada 2005, 49).

Action Research as Defined in this Study

Action research is more often a form of qualitative, or ethnographic research, but does not exclude the collection and analysis of quantitative data. In either case, it seeks to understand why something happens, rather than documenting the frequency of occurrence to establish what is happening, and involves smaller samples of participants for the purpose of gaining insight and depth of understanding of a specific case rather than generalizing from sample to population.

The research question may emerge or develop as action research unfolds. The PR develops a research plan that includes the purpose, the subjects, and the innovation. Data-collection decisions and methods of analysis include the sources of evidence, methods of collection, how meaning will be derived by connecting to frameworks, and how evidence

will be relative to the research question (Anderson and Burns 1989, 98). Data grow from fieldwork as PRs collect evidence through observation, field notes, journaling, interviewing, questionnaires, focus groups, case studies, and several other standard qualitative-research methods.

Action research is distinguished from formal research in that its results are articulated through an action plan that addresses the problem identified in the action research (figure 2). In practice, it often lacks a theoretical framework, and its method tends to be less rigorous, particularly with regard to standards for validity. Action research in the three-dimensional model is defined as closely as possible by the elements of formal research. According to Isakson and Boody (1993) method should address standards established by Lincoln and Guba (1985), including: credibility from multiple data sources, or triangulation, that addresses internal validity; transferability that addresses external validity, or credibility; dependability of conclusions that logically connect to findings that are shared with colleagues to ensure accuracy; and confirmability, or evidence from field notes provided to support interpretation. Analysis can include categorization, descriptive statistics, and the identification of patterns in the data. The model developed and piloted in this study maintains the integrity of formal research to include writing a proposal, albeit in outline form, including the research question, a theoretical foundation, and methods of data collection. Such a challenging interpretation of action research requires a practicing researcher who acts as a mentor to the SLMSs. A three-dimensional action research model (figure 1) provides this support while bringing together three simultaneously executed initiatives: (1) the context, or ALT and assessments for the instructional unit developed through collaboration between and among SLMSs and classroom teachers; (2) the blueprint, or design for executing the action research study of the PRs; and (3) the evaluation through a formal research study of the three-dimensional model conducted by the MR that analyzes the impact and effects of the first two dimensions.

The Setting for the Study

When the study began in 2000-01, the Londonderry School District was the fifth largest school district in the state, serving a growing middle-class community with a student enrollment of 5,318. School attendance was, and continues to be, high (2000: almost 93 percent; 2004: almost 95 percent) and the drop-out rate is low (2 percent). Between 73 (2000) and 83 (2004) percent of students attend two- or four-year colleges. The percentage of special-education students was 18.6 percent in 2000 and 17 percent in 2004. The ethnic breakdown (from the 2000 census) is 99.2 percent white, with a trace population of English as a Second Language. In the state standardized achievement tests, (New Hampshire Educational Improvement and Assessment Program), sixth- and tenth-grade students consistently outperform the New Hampshire state averages in all subject areas. In 2000, all 427 faculty members were licensed by the state, with 26 percent having more than twenty years of teaching experience and more than 50 percent holding master's degrees or higher. In 2004, 451 teachers were employed. The cost per pupil in 2000 was about $6,000; slightly below but close to the state average per pupil cost. In

2003 (latest data available), the per-pupil cost was $7,440, also slightly below the state average.

The Library, Media, and Technology department is headed by a director who supervises and evaluates the building-based professional library media and technology staff as well as district-level personnel. At the beginning of the study these included: eight SLMSs--three experienced, full-time elementary SLMSs; one experienced middle-school SLMS who worked in libraries for several years, and one who was near the completion of a program that would certify her; two full-time and one part-time high-school SLMSs; a technology integrationist; a program assistant; a Web technician; and a TV and video technician. The director leads the department in developing instructional goals, curriculum, and evaluation measures. In 2000, the library media program won a national award, School Library Media Program of the Year, conferred by the American Association of School Librarians to exemplary programs, and it is well-regarded in the district as an integral part of learning and teaching. The superintendent and board of education are supportive of the program and its director, who is well respected for her vision and wide range of knowledge in her field. She gives priority to professional development, integrating it whenever possible with day-to-day practice of the professional staff who attend national and state conferences on a regular basis, often in the capacity of presenters. There is a high level of awareness of best practice and emerging research in evidence-based practice.

Conceptual Framework for the Action Research Model

The conceptual framework for this model (figure 4) indicates the roles and interpersonal dynamics of the participants. In this model, the SLMS is referred to as PR. The first and second dimensions of this model required PRs:

11. To develop ALTs for students in collaboration with classroom teacher(s) by targeting an area of their instruction (such as note taking) as the object of their investigations
12. To investigate, in collaboration with classroom teachers, the generic question, How can I do it better next time?
13. To develop an action research study in collaboration with an MR that addressed a specific problem unique to each of their instructional practices

The MR provided the following services to PRs:

14. Support for the design and implementation of ALTs and assessments
15. A common structure for the action research that gave PRs freedom to explore their specific areas of interest with regard to information-literacy instruction
16. Student support materials (e.g., templates, help sheets, models, or exemplars) for the PRs' action research projects
17. An open channel of communication

18. Feedback from the formal research study of the action research

The director of library, media, and technology collaborated with the MR to conceptualize the action research plan. She was a valuable source of advice and support for logistical and procedural questions and she secured funding for the project. She received copies of all e-mail correspondence between the MR and the PRs and helped with decisions regarding district policy and logistics. Her working relationship with the superintendent and board gave high visibility to the training model and communicated the impact that the project had on teaching and learning in the district.

First Dimension: Planning Guided Inquiry and Authentic Teaching

Though PRs sought the advice of the MR as needed, each had autonomy in the design of an instructional unit, in collaboration with classroom teachers. Some chose units they had done before while others elected to design new units. The topics they chose to investigate through action research included: note taking (two projects); higher-order thinking skills (two projects); use of a variety of sources; evaluation of Web sites; use of databases versus the Internet; teaching styles; and classroom computers. Their unique research questions grew from the planning and design of their teaching units. With the help of the MR, they wrote proposals using a template designed by the MR. The proposal included a detailed description of the instructional unit, a research question, and data-collection methods. The mentoring of PRs took place concurrently over a fourteen-week period. The MR taught the elements of formal research during two sessions of direct instruction that took place prior to the action research itself. The MR taught the elements of formal research during two sessions of direct instruction that took place prior to the action research itself. During the first on-site visit, the MR introduced concepts and elements of research, defining action research as ethnographic--or qualitative--research conducted in the context of guided inquiry, and characterized by: (1) an instructional unit that integrated information literacy and academic curriculum content; and (2) ALTs and assessments.

The role of the PR was that of teacher, librarian, and researcher. The MR introduced naturalistic inquiry and stressed data-collection methods that were already familiar to PRs, such as rubrics, journals, portfolios, and other measures that they had used extensively in the past. She also introduced data-collection methods of formal ethnographic research.

The following tasks were set for the PRs in the second group session:

19. Define the elements of the research, including the research question, data collection, and analysis.
20. Get started by examining units the PRs had implemented in the past.
21. Generate a research question based on what they knew about their practice.
22. Choose a classroom teacher as collaborator.

23. Select a curriculum topic that suited the ALT model. In the first dimension, PRs, who were adept at using authentic assessments in the design of student projects, were trained to develop units of inquiry that met the criteria for the content, method, and design of an ALT, as shown in table 1.

The use of ALTs and authentic assessments, when used concurrently with action research methodologies, constitutes authentic teaching whereby learning takes place in real-world contexts for learning tasks that meet the criteria listed in table 1. The benefits of this model (figure 5) derive from the generation of data that serves the dual functions of PRs: ALTs and action research generate data or evidence that PRs need in their roles as both teachers and researchers, to assess student learning and understanding in order to revise their teaching strategies.

The MR chose ALT for the design of instructional units because ALTs require learners to shed the persona of *student*, i.e., science or history student, and assume real-world roles that require them to approach problems as scientists or historians. The authentic learning task generates evidence of student performance through formative assessments applied throughout the teaching of the unit. The PR can tailor these formative assessments to the specific aspect of instruction to be studied and analyze them as data.A basic premise of authentic assessment renders formative assessments ideal for action research because they indicate when, and often why, students are not "getting it." The purpose of these ongoing formative assessments is to revise instructional strategy to improve student learning. Additionally, ALT constituted an authentic teaching approach whereby evidence-based practices challenged paradigms that reduce inquiry learning to project work, student research to "reporting," and instructional design to product-centered, rather than process-centered, teaching.

During the second group orientation session the MR presented the criteria listed in table 1 to the PRs as a rubric for the ALT. While this teaching method was not new to most of the PRs, they needed to shift their perspective from teacher to researcher by viewing this method as a data-collection tool.

Detailed information about data collection and analysis were not covered in these sessions; they were introduced in a one-on-one basis through e-mail correspondence and two on-site visits. The MR also provided a structure for the action research process, which will be described in the discussion of the third dimension of the model. She also set the timelines and provided advice throughout the project.

The Second Dimension: Planning Action Research

The PRs summarized their action research plans using a proposal template as shown in figure 6 that the MR provided. The proposal was intended to mimic the doctoral dissertation proposal that provides a plan for the intended study. It served as a formative assessment that invited feedback from the MR for revision and improvement of the planned study. The materials that were developed to teach students how to do authentic

research were this instrument, as well as several others used to support PR research (Gordon 1999).

The proposal template helped the PRs to focus their action research as well as plan their instructional unit. A guiding question was, "How can you change your teaching to help students perform better?" The researcher developed this instrument from Kuhlthau's (1986) Information Search Process (ISP) that identifies prefocus and focus formulation as critical stages for users engaged in ISP. Figure 7 illustrates the process from initiation to closure and includes the feelings, thoughts, and actions of the information users. This was a familiar model with which the PRs could relate since they had observed their own students in the various stages of the ISP model. Kuhlthau (2003) discovered that the patterns of experience of information users represented in this model matched those described in the process of construction. Harada (2005) noted in a study of librarians and teachers as research partners that the elements of practitioner research paralleled Kuhlthau's ISP as participants moved through the same process their students were experiencing. The ISP model created a context for dialogue whereby the MR could suggest direction and offer ideas for refinement. It also served as a guide for developing other support materials as the researcher gained an understanding of the emotional, cognitive, and behavioral aspects of the PRs' learning.

In addition to the unique research question submitted by each PR, the MR provided a generic research question (figure 8) that formed the underpinning for each study: How can I do it better next time? PRs could modify the questionnaire as they wished. Its intent was to collect data from students about their ALT while providing a model questionnaire for the PRs.

The generic questionnaire provided an exemplar for PRs. The MR advised PRs that they could start with the more general questions of "How can I do this better next time?" and then focus on more specific questions about information-literacy instruction. This gave the PRs a framework for examining their practice and choosing an area for investigation. It also facilitated triangulation, as PRs needed to construct only two other instruments for data collection.

The MR also provided a help sheet for constructing a questionnaire (table 2). This detailed instruction sheet guided the PRs through the process of choosing samples, constructing questions, and meeting standards of validity and reliability.

The concept of a Respondent Profile provided PRs with more options to analyze responses to the questionnaire (figure 9) or their interviews. PRs were encouraged to develop items for the profile that were relevant to their research questions, that indicated what the researcher wanted to learn from these data, and that highlighted whatever connections they suspected might be useful. PRs were advised to include this profile at the top of their questionnaires or as a separate paper, but to be careful to keep it attached to the respondent's questionnaire or to the transcribed notes made from interview tapes.

The MR also provided a help sheet for constructing an interview (figure 10).

At the end of the instructional unit, the PR held a reflective meeting with the classroom teacher to review the results of data analysis, including student responses to the "How can I do it better next time?" questionnaire. They also attended a debriefing meeting with the MR and director of Library, Media, and Technology to share their findings and provide feedback on the action research process. A culminating activity was the presentation of the PRs' action research projects and findings at a state school library media conference.

The Third Dimension: The Mentor Researcher's Method

Ongoing support for the PRs was delivered through five on-site visits ([figure 11](#)), 221 e-mails, and five telephone conversations with the director. Interviews were held with individual PRs during four on-site visits. These interviews were timed to coincide with the selection of data-collection methods and with analysis of data. Based on the questions delivered through e-mail, the MR decided that face-to-face support was needed. A debriefing session was held to verify the MR's findings and to process and plan the second year of the action research project. Benefits, constraints, and challenges were discussed.

A departmental meeting in June focused on feedback from the PRs regarding the effectiveness of the action research project. The MR used guiding questions to structure the conversation and collect data ([table 3](#)).

Feedback on design, feasibility, and validity of the PRs' action research was ongoing and intense and included theoretical readings, data-collection instruments, models, and examples when appropriate.

From January through June, the PRs corresponded with the MR via e-mail. The MR responded to all e-mails within 24 hours, and to each PR individually rather than to a list, and the director was cc:ed on all e-mails. The e-mail medium protected the privacy of each participant and encouraged questions and dialogue with the MR while offering the option of sharing information with the list. When appropriate and necessary, the MR sent group messages for purposes of instruction, clarification, and elaboration.

The MR read, coded, and categorized the content of the 221 e-mails. These data were triangulated with data from interviews and debriefings, and from the work submitted by the PRs.

Findings: How Did the Three-Dimensional Model Work?

This section discusses how the action research model under study worked from two perspectives: (1) the transactions between the MR and the library director; and (2) the

transactions between the MR and PRs, which fall into two stages: the planning stage and the implementation stage of the action research process.

Transactions Between the Mentor Researcher and the Library Director

The rapport and level of communication between the director of Library, Media, and Technology and the MR was a key element in the project. The twenty-nine e-mails exchanged between them were supplemented by five telephone calls and face-to-face meetings that served to monitor progress and discuss preliminary findings of the MR. The content of these e-mails included logistics, strategy, and evaluation, as shown in table 4.

Because the e-mail transactions averaged 188 words and were, for the most part, rooted in specific stages of the research, the unit of analysis was the paragraph. The ratio of e-mails initiated by both parties was almost one-to-one, indicating that there was a good flow of communication. The director took the initiative and responsibility for most of the logistics, which included provision of supplies; setting time frames and deadlines; scheduling of on-site visits, interviews, and debriefing sessions with the MR and PRs; and setting agenda items related to the action research for monthly departmental meetings. The director sent twenty-nine e-mails to the PRs, mostly regarding logistics, and usually at the request of the MR. While the director was cognizant of all transactions (since she received all e-mails and monitored progress), she allowed free flow of dialogue among the PRs and MR. She encouraged her staff at appropriate times and provided guidance as follows when requested by the MR.

- o Relate data collection to your research question
- o Include a respondent profile (gender, grade level, computer proficiency self-rating) in your questionnaire so that data could be analyzed with respect to selected student qualities in a search for patterns
- o Use teachers as a source of good information about students
- o Write a journal writing about the research process
- o Try to have fun!

The MR initiated e-mails and conversations to the director related to defining strategies, such as setting the purpose of the action research project and formulating policy and decision-making regarding the action research process itself.

Informed Consent

The MR followed procedural guidelines adopted by her university which required a letter of informed consent for research involving human subjects signed by the parent or guardian of each student involved in the research. In many cases this meant over 50 students, but totaled not more than 320 students. She distributed the letter to the PRs via email, which was not well timed since some PRs had begun to collect their data. PRs were concerned that parents would misinterpret the nature of the research or become alarmed, even though the letter assured students would remain anonymous. The PRs

perceived the letter as time-consuming, detracting from the time the PRs had to spend on their action research, and unnecessary. The MR responded as follows:

> Informed consent is mandated by the U. S. Department of Health and Human Services (2005) and applies to all research involving human subjects conducted, supported or subject to regulation by any federal department or agency. When research is conducted by researchers affiliated with universities, Institutional Review Boards regulate and monitor compliance with these policies.

The MR worked with the Director of Library Media and Technology, who received copies of all email correspondence. She managed this issue, contacting the Superintendent and principals. The Superintendent made the decision that only students who were identified during the collection of data, (i.e., interviews, focus groups) needed to have informed consent, which is substantiated by the exemption in federal policy that states, " Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects (U. S. Department of Health and Human Services, 2005).

Transactions Between the MR and the PRs

Most of the support given by the MR to the PRs was through e-mail that totaled 192 transactions. There were two types of e-mails:

29. The one-on-one correspondences initiated by PRs seeking assistance. These messages were, for the most part, presentation of work and requests for feedback. The MR analyzed one-on-one correspondence by levels (elementary, middle, and high) to find similarities and differences among them;
30. The group e-mails sent by the MR for purposes of instruction, clarification, and response to submitted work. Group e-mails were coded for categories of types of assistance given, which included advice on method, clarification, and feedback.

Figures 12, 13, and 14 summarize the data from the transactions between the MR and PRs. These data are discussed in two sections: the planning stage (figure 12) and the implementation stage (figure 14) of the action research. Figure 13 looks at the data by average word count of the discussions about the research components in e-mails in addition to the number of e-mails containing these references. The labels in these charts (i.e., topic selection, instructional unit) correspond to the categories that emerged from analysis of data as set by the MR to define two major stages: planning and implementation. These categories relate to the way the MR structured the stages of the research process, based on three inputs: (1) Kuhlthau's (1986) ISP that addresses the intellectual, emotional, and behavioral stages of information searching; (2) the work patterns of SLMSs who collaborate with classroom teachers to design and implement integrated units of inquiry; and (3) traditional formal research requirements set forth in

American colleges and universities for dissertation studies on the doctoral level. Data from other sources are incorporated with the analysis and discussion of these data.

Planning Stage of the Action Research

Figure 12 shows that ninety e-mails were devoted to planning the action research, i.e., advice sought and received on topic selection, designing the instructional unit, formulating the research question, and collecting the data. This is about 50 percent of the total number of e-mail transactions between the PRs and MR. Prefocus and focus-formulation (Kuhlthau 1986) problems dominated the research components of topic selection, designing the instructional unit, and generating a research question. Figure 12 indicates that the total number of e-mails devoted to these components (TS, IU, and RQ) totaled thirty-eight, which does not reflect the intensity of these transactions. To address this, an e-mail was determined to be about the research component if it contained more than one sentence about it. This was considered a paragraph and the paragraph was the unit of analysis. The data in figure 13 were analyzed by comparing the average number of words in these paragraphs to the number of e-mails written about a research component to determine what was problematic for the PRs. These word counts do not include attachments that contained drafts and completed versions of the work submitted by each PR (e.g., proposals, support materials for students, data-collection materials).

The high average word counts of components of the planning stage as compared with the implementation stage are indicative of the difficulty that PRs had with components of this stage, particularly data collection. In a debriefing, one PR commented that she didn't know what they would have done without the MR when they were collecting data. She thought it was the most difficult part of the action research.

The references in e-mails written prior to the completion of the proposals, including topic selection (TS), instructional-unit design (IU), research question (RQ), and data collection (DC), show a higher average number of words than the e-mails sent after the proposal was written, i.e., after the e-mails concerned with data collection. The proposal template (figure 6) addressed the prefocus and focus-formulation stages of Kuhlthau's (1986) ISP, the most crucial stages that determine the learner's satisfaction or dissatisfaction with their product (e.g., research paper, presentation.) Focus formulation that dominated the planning stage accounted for the PRs' confusion and frustration. This high average count of planning-stage e-mails indicates the need for and the effectiveness of a focus-formulation tool and indicates that the proposal template was effective for this purpose.

An analysis of the data from the planning stage of the action research follows.

Task Initiation

Problems encountered with selecting a topic, designing an instructional unit with a classroom teacher for students, and formulating a research question were problems of task initiation (Kuhlthau 1986): understanding the task at hand and plotting a strategy for structuring the task. All PRs expressed confusion and frustration with the concept of the

parallel implementation of the ALT and the PR's action research. Although authentic assessments, such as rubrics, journals, and portfolios, were not new to the PRs, designing ALTs was. There was confusion about the duality of their roles: guiding student research while conducting action research. In addition, the PRs had to shift their perspective from teacher to researcher when they formatively assessed their students. As teachers, they looked for alternative teaching strategies to apply immediately to facilitate student learning. As researchers they collected the data generated by formative assessments to be analyzed in triangulation with other data. In a debriefing session when the MR noted that most of the instructional units looked more like projects than ALTs, she asked PRs if they would recommend eliminating ALTs from the training model. The unanimous consensus was that they saw the value in this method and wanted to retain it and refine this aspect of their practice. The multitasking required by the first and second dimensions was different from anything the PRs had done in the past. In some cases, familiarity with the task of designing an instructional unit actually impeded progress with designing ALTs and viewing them as data generators.

The MR's presentation, which included explanations and examples of all the components of the three-dimensional model, was not enough; PRs needed a lot of support in the beginning. In fact, the presentation seemed to confuse them. One PR wrote:

> the general concept is not clear to me. I have talked with some of the other staff and they seem to have the same issue. At a very high level, how would you summarize the task we are trying to accomplish? What are the major components? What do you recommend in terms of implementation? Do we first decide on a project and explain it to the teachers involved in what we are doing? What do you suggest if there is an area where a lot of improvement could be made but staff is reluctant to do this?

The confusion is understandable: there was not only a lot of new information presented in one day, but their new roles constituted a paradigm shift. PRs were bewildered by what was ostensibly familiar to them, i.e., designing an integrated unit of information literacy and academic objectives, collaborating with teachers, using authentic assessments, residing in a new context of the action research itself. Despite a wealth of prior knowledge, they felt overwhelmed and did not know where to start. Two group sessions of direct instruction that addressed the questions in this e-mail did not seem to adequately prepare them for the task. It was only after PRs successfully thought through to the data-collection process that they understood the first and second dimensions of the project.

Data from the questionnaire administered at the end of the action research project revealed their perceptions of their own confusion. Half of the PRs felt that the introduction was not clear enough. A typical statement was, "I was confused at the initial presentation. I reviewed the slides and info presented and was still confused. Somehow this introduction to the project needs to be clearer." They also felt that the task became increasingly time consuming: "When this was initially presented to us, it seemed to be a smaller endeavor, but seemed to grow in time commitment as the days went by. ... It overwhelmed me at times." PRs offered suggestions. "It would have been helpful, at the

beginning of the project to meet with [the Mentor Researcher] to discuss action research and brainstorm as a group individual ideas and projects." Another noted, "I feel it would have been helpful to have more meetings with (the Mentor Researcher), the Director, and other librarians, more sessions where we talked about what the process really was. As a person new to the role of media specialist, I often feel that I needed more direction." One PR noted, "A concrete example always helps me to see where I am headed ... now you will have some!"

Despite the strategies and support materials provided by the MR, this confusion persisted for the first few weeks. One PR wrote, "Please bear with me and sorry for all the questions. I have a lot of good traits, but doing something like this doesn't come easy to me."

There was a difference in the way that PRs from the three levels of instruction approached task initiation, topic selection, and the research question, as shown in table 5.

Elementary PRs focused on student learning in general ("My questions or goal would be how to incorporate higher levels of thinking skills in the unit"). They looked at curricular topics first to focus and relate information skills to those topics. One librarian was half-way through her inquiry unit with students before she formulated her final version of the research question. This is probably attributable to the child-centered, rather than subject-centered, nature of teaching at that level. Two middle-school SLMSs started with specific information-literacy skills ("Which method of note taking will student choose when given a choice?"). They worked together on the same unit of inquiry and action research study. Within five e-mails they developed their focus for the inquiry unit, targeting note taking: "During the year we have instructed students using two different models of note taking and several options for recording notes. It would benefit us and teachers designing instructional units this summer to have options that work well for students of differing needs and abilities ... while the exploration of [note] collection would be interesting, we think either of the above will be more practical and yield more immediate results for students." High-school PRs were diagnostic with regard to information skills "Can we motivate students to use subscription databases through a demonstration lesson?" They developed their research questions almost simultaneously with topic selection because they were problem-oriented, anxious to tackle plagiarism, and demonstrated under-use of subscription databases and inadequate note-taking.

Opportunities for differentiation of help were offered by one-on-one e-mail communication. Many PRs worked through more than one, but not more than three ideas for a research question. In most cases the MR offered suggestions for introducing and refining the variable that would be examined by the PRs. There was also a need to point out when there were too many variables that could not be controlled. For example, a PR wanted to look at how teaching and learning differed in classrooms with and without computers but did not realize that she needed to control for differences between teachers if she looked at classes with different teachers. Group e-mails were an efficient way to address common concerns and offer elaboration and clarification of concepts and

procedures. Examples of topics of this nature were feasibility, particularly with regard to time constraints; reliability and validity; and completion of the proposal template.

Data Collection

The fifty-two e-mails related to data collection constitute the largest number of e-mails generated ([figure 12](#)) for a component of the research. The PRs agreed that this was the most challenging component of the action research, as stated by them in meetings and in their responses to the questionnaire administered at the end of the action research. [Figures 12](#) and [13](#) indicate the frequent and intense assistance that PRs needed through e-mail transactions. The content of these e-mails indicated that confusion between the first and second dimensions persisted for a few PRs: "Does this (data collection) refer to the student project or to our evaluation of the student projects?" There were several problems confronted by the PRs in this stage of the action research.

- **Understanding the nature of qualitative research--**PRs transferred prior knowledge of quantitative research to their qualitative-based action research project that influenced their understanding of the intent and method of data collection. Many thought they needed to prove something, have a control group, and rely on numerical data. The MR explained, "You don't have to prove that one method is good, or even working. Your goal is to gather evidence that helps you see where the weaknesses in the assignment are, and what you can do to improve the assignment." There was a lot of concern about sample size, and what would be representative, particularly for those PRs who relied on numerical data. The MR identified concerns about the relevance of data-collection methods to the research question. She advised a PR, "Do you really need a questionnaire to determine how much students learned and how they felt?" A big step in understanding ethnographic research was for PRs to recognize how they already use elements of this kind of research. One PR wrote, "My goal is to keep the project fluid enough to be directed by the students and by changed needed to be made with constant observation and evaluation."
- **Generating data from the instructional units**--Although the PRs were familiar with the tools of authentic assessment, they had never used an ALT as a source of data. They had used formative assessments--such as checklists, for example--to diagnose difficulties students experienced and adjust their teaching to address those difficulties, but they had not thought about them as sources of data that they could analyze and triangulate with other data. This improved with practice, however. One PR composed a reflective questionnaire when students were not taking notes to determine their progress. She revised her instruction accordingly.
- **Choosing a data-collection method--**The MR encouraged PRs to collect data through observation as a preliminary step to choosing a method. When the unit was in progress, PRs began to see how they could use student work and formative assessments as data. One PR wrote, "I planned to save the maps they create and will analyze them." Problems with early attempts to construct data-collection methods resulted in lack of a connection between the research question and the data-collection method. PRs struggled with choosing a data-collection method and

relied heavily on the advice of the MR because they wanted to ensure they would find the answer to their research question. A PR commented, "I do not know what we would have done without your [MR's] help."

- o **Documenting observation with field notes and research diaries--**PRs had difficulty finding time for documenting observations in detail in research diaries. The MR advised, "listening to your students may be your best data-collection tool. You will want to record exactly what they say so take good notes." An analysis of research diaries revealed the emphasis on the progress of the instructional unit at the expense of depth analysis and synthesizing with regard to the research question.
- o **Managing time and feasibility--**Most of the PRs identified time as a factor in the difficulties they had. "I would have liked more time for the planning stages." When asked to identify the most difficult aspect of doing action research, five of the nine PRs mentioned time: "Tight time schedule to find a project, plan, and implement it." Feasibility problems were usually related to time constraints. The MR acknowledged this conflict: "Please look at this for feasibility. I don't want the research to take too much of your time when you are helping and teaching students." She wrote to another PR, "Think about feasibility. Do you have a willing teacher, a group of students, and scheduled times when you can work with a teacher who already uses the writing process?"
- o **Constructing questionnaires--**The MR provided a lot of support for questionnaires that set high standards for validity and reliability (see table 2, Help Sheet, and figure 9, Example of a Respondent Profile). Most inquiries about questionnaires centered on implementation. When do I administer the questionnaire to students? Do I need a pre- and post-questionnaire? What about validity and reliability? The MR offered the following advice:
    - Let your research question guide you in the development of questionnaire items.
    - Use the rubric you constructed as a summative assessment for the ALT to guide you in the development of your questionnaire items. This will help to collect the data that are most relevant to the goals of the unit.
    - Use the generic questionnaire for format and ideas that can be translated to your specific research question.
    - Develop the respondent profile in conjunction with the questionnaire items so that you have the data to link the profile items with the question.

Questionnaires in conjunction with interviews, for purposes of triangulation, were used most often by PRs. The MR encouraged PRs to use the results from questionnaires to construct interview questions in order to get in-depth data about phenomena. Initial items of questionnaires PRs constructed were cumbersome or time-consuming and required revisions. PRs had difficulty constructing questions and conceptualizing how they could yield results that would address their research questions. They had questions about administration of questionnaires in terms of sample size and timing. Most used pre- and post-questionnaires to determine whether their variables had made a difference. Support materials provided by the MR were critical for this stage of the action research.

- o **Constructing interviews--**The MR offered the Help Sheet for Constructing an Interview (figure 10). Constructing interviews was not as problematic as questionnaires. PRs were more comfortable with this data-collection method and used it throughout their units in both formal and informal settings. They used structured and unstructured interview formats and most PRs combined these methods. They had questions about sample size and timing.

Components of the research that did not pose problems include:

- o **Content analysis**--The PRs used content analysis extensively to look at student work, e.g., bibliographies for a research paper assignment, mind maps, and journals. They did not seem to have difficulty with this method and were responsive to problems they detected.
- o **Meeting formal research standards--**PRs quickly grasped the importance of research standards. Triangulation, as evidenced from the descriptions of data-collection methods described in this section, provided internal validity to their action research. The MR consistently raised PRs' awareness of validity with questions like, "How do you know that the intervention you administered is the only factor in the change you observed?" "How do you know that you are measuring or assessing what you say you are?" The MR provided structure and uniformity of approach that ensured reliability and transferability of the action research.

Implementation Stage of the Action Research

Figure 14 shows that ninety-four e-mails, or about 50 percent of the total number of e-mails between the PRs and MR, related to

- o implementing the action research, i.e., applying educational theory to the instructional unit;
- o collaborating with classroom teachers;
- o sharing the work among PRs;
- o analysis of the data;
- o praise and encouragement offered by the MR;
- o progress reported; and
- o logistics.

The average word count of references, however, was much lower than the average word counts in the planning stage (figure 12), indicating that the need for explanation and elaboration was not as intense in the implementation stage. Logistics and praise and encouragement constituted more than half of the total number of e-mails in this stage.

Analysis of each component of the implementation stage follows. The average word count for these e-mails is low (figure 13) compared with the average counts in e-mails of research components in the planning stages. The average word count for discussions

about theoretical framework was the highest of the research components of the implementation stage.

Theoretical Frameworks for Action Research Projects

The theoretical framework is the element of academic research often omitted from action research. Because action research is considered to be practical in nature, aimed at improving practice, theory may not seem relevant. Proceeding on the premise that there is nothing more practical than a good theory, a comment attributed to Lewin, the MR established the theoretical foundation as constructivism with brief introductions to Piaget, Dewey, and Vygotsky in the orientation sessions. With this framework in place, establishing individual theoretical frameworks was postponed until implementation after planning-stage issues were resolved. Regardless of the timing of working with theory, it is interesting to note that the theory-setting stage (TH) shows a higher average word count per e-mail than the subsequent stages of implementation (figure 14).

The constructivist theoretical framework set by the MR was refined by the PRs when the MR introduced specific learning theories in a one-on-one basis to help them to connect theory and practice. The MR refereed PRs to Web sites that succinctly presented educational theories and the work of theorists who were instrumental in defining best practice (table 6). She wrote, "I know you will not have a lot of time for background reading, so in addition or in lieu of being your searcher I can filter this information to you, especially for the learning theory that will form the foundation of your study. I suspect we will all be using constructivist-based learning theory." The information and Web sites provided background reading for formulating the research question as well as for defining theoretical frameworks for the PRs' action research. The PRs related these theories to their research questions as well as to data collection. Theory also helped the PRs understand why they chose particular methods or materials to support their students and provided a touchstone for analysis. For example, one action research study used Bloom's taxonomy to categorize and analyze her data when determining whether her students were thinking critically.

The MR also referred PRs to external sources, i.e., leaders in school libraries who model best practice (table 6) based on constructivist theory. The PRs used these sources to design their ALTs and action research studies. Exposure to this literature helped PRs bridge the gap between theory and practice, and provided knowledge that gave depth to their understanding of their action research.

Sharing Interactions Among PRs

Sharing ideas among PRs was explicitly promoted by the MR in eight e-mails (figure 11), with a total word count of 4,663, or an average word count of 259 (figure 13). This is quite high when compared to the average counts for other categories. The high word count can be attributed to the detailed e-mails initiated by the MR to promote sharing. Sharing occurred naturally within each level; the three elementary PRs met regularly to brainstorm and share ideas and within the first two weeks had worked out the process.

This was more difficult across levels. For example, one elementary PR and one high-school PR examined note taking but were not aware of this until the MR prompted them via e-mail to share their research. Sharing also took place in real time. One PR wrote, "I have been meeting with J and C and we have been sharing correspondence. We are still a bit confused, but I imagine we will survive this stage. I welcome any input!!!" The PRs enjoyed the camaraderie, support, and morale boost of their interactions. The presentation at the state conference, the MR's presentation at the board meeting, and the debriefing at the end-of-the-year Library, Media, and Technology department meeting were vehicles for sharing findings.

E-mails initiated by the MR also served the following purposes:

- o **Clarification and reinforcement of research concepts--**One PR was not present for the MR's orientation to action research. "For the most part, I am pretty much clueless and I am hoping that it is because I came a little late into the process. I'm trying hard to think of a question or hypothesis." The MR took advantage of this opportunity to tutor her through e-mails that were copied to the other PRs who benefited from this written version of the mentoring process in a "think-aloud" mode. She wrote to the PR, "If others in our group are having difficulty getting started, would you mind if we shared these e-mails to give them a solid example of how the conversation between Mentor Researcher and Practitioner Researcher can begin?"
- o **Providing structures and models--**The MR used e-mails to everyone to provide the support materials as described in tables 1 and 2 and figures 6, 8, 9, and 10. She set guidelines for the state conference presentation and deadlines for the completion of various stages of the work, and disseminated exemplary work done by PRs (e.g., proposals, questionnaires). The MR structured research-question formulation and choice of data-collection methods through a generic question. She wrote, "The broad question for us all is 'How can I teach this unit better next time?' Check to see that your data-collection methods address this question."
- o **Addressing concerns--**The MR raised concerns to the e-mail list about issues that surfaced as trends. Feasibility was one of these, along with time constraints, the relevance of data-collection methods to the research question, the design of ALTs and authentic assessments to generate data, validity concerns rising from multiple variables, and construction of questionnaire and interview items.

Analysis of Data in Action Research Projects

Although the MR differentiated assistance through the use of e-mails during the stage of analysis to meet the individual needs of the PRs, e-mail activity during this stage was low, as seen in figure 14. This is explained by a site visit during which the MR held one-on-one meetings to help PRs determine how they could best handle their data. In these meetings, the MR stressed the need to analyze data on an ongoing basis in order to let the data drive the investigations. Categorization and color coding were explained. To facilitate this, PRs were advised to number all items on their questionnaires, respondent profiles, and interview schedules. Most questions from PRs were about how much

analysis needed to be reported. For example, "Did you want all the numerical breakdowns on all the questions on the questionnaire and interview?" PRs had no problems with the concept of triangulation since they were using multiple sources of data that, in most cases, yielded numerical and verbal data. The chart in table 7 shows the methods of analysis presented to the PRs.

The MR considered the PRs' presentations at a state conference as data. The PRs worked in teams: elementary, middle and high, and presented to an audience of their peers in breakout sessions. These sessions were prefaced by brief presentations by the director and MR that provided an explanation of action research and definitions of their respective roles. The conference presentation offered opportunities for clarification of the action research process. One PR wrote, "I started to work on the handouts for the presentation. I've attached one page of the findings. Am I on the right track? Question: Would you clarify the difference between the description of the unit and the abstract?" Figure 15 summarizes the guidelines that the MR provided to the PRs in response to their requests.

Praise and Encouragement

A key factor in the role of the MR was to be sensitive to the morale of the PRs and to offer praise and encouragement when appropriate. One-third of the twenty-seven comments were specific to various aspects of the research. For example, "Your presentation is top notch. I like the last slide and would retain it. Folks will need to hear things twice because there is a lot of new information in the presentation. Would you share this ... with other librarians as an example? It has all the elements and is superbly executed. Thanks for all your hard work." "Your reflective questionnaire is wonderful. Great idea." "The research question and adaptation of the questionnaire are great."

Two-thirds of the comments were general. For example, "You have done a nice job planning this." "Good luck and please let me know if you have any questions." The e-mail medium was helpful in maintaining a high level of encouragement.

How Did the Action Research Inform the Practice of SLMSs?

All effects of the action research on the practice of SLMSs are analyzed as facets of role perception, which emerged in the analysis as the framework for their practice. The researcher organized the data from various points of view with regard to role perceptions, as discussed below. Another organizing factor with regard to their practice was collaboration between teacher and SLMS, which took place in two dimensions: (1) the traditional collaboration to plan, design, implement, and evaluate the students' learning task; and (2) the incidental collaboration that evolved from the interfacing of student learning and action research. It is useful to consider the role of the classroom teachers' in this project as well as their perceptions of the SLMSs' instructional role to gain further insights in to the collaborative process.

The Classroom Teachers' Role in Action Research

The classroom teachers played a part in planning the authentic assessment assignment, helping PRs collect data, and evaluating the unit in a reflective meeting at the end of the project. The MR advised the PRs to use the results from the generic questionnaire at their meetings with teachers to provide feedback on what students thought about the unit. They were advised to try to get teachers to think concretely about specific changes and to keep detailed notes with their materials so they could use them the following year to redesign the unit, incorporating the consensus of the teachers and PRs. The MR also encouraged PRs to "get feedback from the teachers on what worked and what needed to be revised" when the instructional unit was in progress. She urged a PR "to speak to a teacher about criteria for choosing your sample." Subsequently, a PR wrote, "I have met with the teacher and have incorporated some of her ideas," which included advice on which student to interview and feasibility issues for data collection. Teachers, however, were not trained participants, although they were aware that the PRs were collecting data on the student performance within the collaborative unit. This transformed their transactions since teachers were no longer in complete control of the instructional unit but did not immediately change teachers' perceptions of the SLMSs' instructional role.

Teachers' Perceptions of the SLMSs' Instructional Role

Teachers did not always see the SLMSs as equal partners. At times the PR had to struggle to get the time she needed to teach information-literacy skills. The MR advised, "I would like to suggest that you make a good case for teaching [information] skills in the context of academics, rather than in isolation. Even if it is a one-day project, students should really be applying what you are working so hard to teach them." Another problem concerned implementation. A PR wrote, "The teacher jump-started the project on me last week so I am struggling to do what I can to get it to adapt. I thought we were set to start this month, but she came back from vacation with all her materials in place, having walked off with my ideas. She has a tendency to plan projects without our involvement and we often have trouble supporting the research. I had hoped to forestall this problem this year by approaching her first but I guess she just doesn't get it."

Despite these traditional challenges of collaboration, there was a strengthening of bonds between the SLMSs and collaborating teachers. The change in dynamics was precipitated by the unique expertise of the SLMSs in designing and implementing action research. This earned the respect of teachers and the enthusiasm of their students. In fact, the three-dimensional model improved perceptions of the PRs as teachers and as experts in research. Teachers became curious about the action research. "Why are only the librarians learning how to do this?" they asked.

SLMSs' View of Their Role

Some PRs identified time as an issue in the success of collaboration. They referred to lack of time to plan with teachers. One noted, "The restraint that time put on us ... did not allow us to choose the teacher with whom we worked." Most PRs however, did

experience sustained collaborations with teachers throughout the instructional unit from which the action research project grew.

SLMSs struggled with their place as teachers in the implementation of the instructional unit. One PR noted, "I'd love to rewrite her [the teacher's] unit--a writing style thing with me--but I don't dare offer." They saw their role as facilitating learning for students and implementation for teachers. The retention of old paradigms in terms of the instructional role of the PRs was an underlying factor in collaboration problems. SLMSs distinguished between their teaching roles and those of the teacher, particularly with regard to grading student work. Formative assessments that were graded presented problems of responsibility. For example, it was logical that the SLMSs grade the bibliographies generated by students for a research paper assignment but this was not obvious to them. Nor did teachers feel comfortable grading them. To resolve this problem, the PR and classroom teacher decided that the teacher would spot-check the resources used and deduct points from student papers when students did not present completed bibliographies with a minimum of seven sources. Although PRs were comfortable with the idea of analyzing student work, they were not prepared to grade it.

Although experienced with the collaborative process, most PRs had difficulty with the logistics of collaborating with teachers using the three-dimensional model. "Do we first decide on a project and explain it to the teachers involved in what we are doing?" "How do you go about choosing the project? Are there criteria?" "What do you recommend in terms of implementation?" There were concerns in the implementation stage about collaboration with teachers. "We've rescheduled her twice and emphasized the importance of our deadline. It is her unit and we have just a small part," wrote one PR. "What do you suggest if there is an area where improvement could be made, but the staff are reluctant to do this?"

These perceptions changed dramatically. A PR noted that the action research "caused me to think about the disconnection between the teacher's and my perception of the usefulness of technology in the writing process and some of the students' perceptions." Another PR noted that the most difficult aspect of doing action research was "making sure the action research blended well with the teacher's objectives."

In the middle of the project the director noted that, "They do not know their own power even though they have carte blanche in their buildings and their principals are very supportive." However, PRs experienced more confidence at the end of the action research with regard to collaborating with teachers. One PR wrote, "I feel I have concrete data, and common discussion points, to bring to the Freshman House teachers on how to improve students' performance. I think the social studies and science teachers can see how information skills affect their curriculums, and that projects must be about taking initiative to collaborate." The reading teacher is working to improve skills we identified as weak and I would like to increase the degree of collaboration with the teacher. The reading teacher would like to enlist me as a compatriot in teaching skills of reading nonfiction." This is significant for the PR because, in this instance, collaboration with the classroom teacher was not successful: the teacher took over the unit and excluded the PR

in the implementation stage after collaborating with her on the design. "Jointly planning the unit with a teacher, from the beginning, was very helpful."

Many PRs were interested in working on collaboration to improve it. When asked what she would do differently the next time, a PR responded, "I would also try to pick a teacher that let me collaborate with him/her in designing the assignment." Another PR agreed: "I would have liked to have been more involved with the teacher from the beginning of the unit. It is difficult to take a unit that 'belongs' to someone else and make it work the way I would like." Another said, "Try to get the teacher to work with me on: (1) note-taking method and skills; (2) having the students spend more of their research time in the library itself where I can have a better handle on how they're doing." Other PRs responded that they would like to study collaboration with teachers in another action research project. "How do we get teachers to involve us from the beginning of the planning process? Teachers often do not include us until after the unit is almost all planned. It would be beneficial if we could help plan more thought-provoking questions instead of just find-the-fact questions." Another wrote, "Why are some teachers resistant to planning with media specialist? Is this a realistic or impossible question to answer?"

A factor in helping PRs gain ownership and confidence was their ability to make the leap from reflection generated by their action research to the action plan. There were many journal entries and comments like this one: "Note taking--kids are on target--have lots of sources, but we need to consider revising our 'Trash or Treasure' review--need to present on overhead--then give each student a researchable question and the paragraph on which to take notes instead of completing it as a group exercise. All students would still have the same paragraph and question, but would be accountable for their own notes." Action research was a powerful intervention that empowered the PRs with hard evidence for improvement of the instructional unit, and consequently, with a sense of ownership.

The way that PRs felt about the action research was a key indicator of their confidence levels and, in turn, their feelings about collaboration. One PR explained the most rewarding aspect of her action research: "It raised my awareness and caused me to think differently about assumptions and making decisions." Although they were excited about their projects and research findings at the end of the action research project, it was not until after their presentations at the state conference that they seemed to find their voices as leaders. They exhibited energy, enthusiasm, and confidence that were transformational. They had clarified their personal teaching theories, explored their sense of self and their role as teachers, and gained awareness of their students' perspectives and needs.

They summed up their feelings in their presentations:

"It was scary at first, but definitely worth it."

"I would like to learn more about statistics."

"A learning experience all around."

"Time consuming but an effort worth pursuing. Why? Because it reminds you of why you do what you do."

While preparing for the state conference presentation at which the PRs were presenting their action research projects, the MR initiated an e-mail that addressed evaluation of the action research initiative. The director commented:

I am certainly in favor of helping get the word out--not only about what the [(practitioner] researchers are doing but how the process has impacted their practice and how it has fundamentally changed the way in which they will approach their work in the future. I view this as a truly program-altering endeavor.

When the PRs made their presentations at the end-of-year department meeting, the director wrote to the MR:

I am awe-struck by the impact this project has had in moving the librarians from an already high-functioning level to a place I do not think many building-based folk have been before. ... J's work is so elegant and crisp--it is a PowerPoint presentation at its finest. I am so proud of all of them. You must be on cloud nine to see what you have wrought!

There is strong evidence that the three-dimensional model improved the quality of the transactions between teachers and their students. There was a strengthening of bonds between the library media specialists and collaborating teachers, despite the challenges of collaboration. Their expertise in the design of authentic learning tasks and assessments and the action research project earned the respect of teachers and the enthusiasm of their students. The three-dimensional model also improved the quality of transactions between the PRs and students: data collection added a new dimension of interaction between librarians and students.

"Great fun to be able to interview students and hear their side of things for a change." "Observing students reach a different level of thinking through teacher's questions ... and interviewing students."

"It was valuable to see how students view research, to get a glimpse inside their heads. It is something we often don't get a chance to do. ... While we often get the view of individual students, it is hard to know whether it reflects the majority viewpoint."

"Working with one group of students over a period of a few days, getting to know them ... knowing that many students really did learn evaluation skills and would, hopefully, incorporate this knowledge into other assignments."

"seeing the enthusiasm and excitement of the students for the project, and
the student's honesty when they participated in the interview and
questionnaire."

The PR who was working toward her certification wrote, "One of the most helpful things
to me was that it forced me to really get into the role of media specialist. I have worked in
the library for nine years, but didn't have the same role to play. This project pushed me to
see my role as a 'leader' and helped me to see that I will be making a difference in the
world of students with whom I work. Also, students will influence me to find new and
better ways to do things."

The action research anchored the school library in the teaching and learning context of
the school, enhancing its instructional role and breaking down barriers between
classroom and library. It bolstered the confidence of the SLMSs and transformed their
perceptions of their role from a support to a leadership function.

Implications for Future Research

The 4-Dimensional Training Model for Action Research

The director of Library, Media, and Technology asked the MR to make a presentation to
the Londonderry School District Board of Education at the end of the school year. The
MR summarized the project and findings of both the PRs' action research and the MR's
formal research. The enthusiasm of the director of Library, Media, and Technology was
infectious: the superintendent and the board agreed to fund the initiative for the next five
years and the project has been written into the district's five-year strategic plan. The study
was replicated in the second year. MR contact with the PRs was the same as the previous
year, with one exception: The total number of e-mails was twenty-one, or 10 percent of
the number of e-mail transactions in the previous year, The content of those e-mails
consisted of completed proposals and data-collection materials that the PRs created.
There were no e-mails that replicated the concerns of the previous year, and no e-mails
that raised new concerns. Site visits and the end-of-the-year debriefing session confirmed
that the PRs had mastered their action research techniques and had successfully worked
independently. A content analysis of the instructional units and the action research
projects of the PRs revealed a consistently high quality of work with little need for
assistance. Problems of collaboration lessened as teachers began to view SLMSs as
action research experts.

In the third year of the project the PRs became the mentors for teachers with whom they
had collaborated during the previous two years. SLMSs were viewed district-wide as the
experts in conducting action research. They still had access to the MR who offered
support for their mentoring. Again, the SLMSs were able to provide support to the
teachers with very little assistance from the MR. This stage of the project was prompted
by teacher interest in learning more about what they were observing when collaborating
with SLMSs. The director commented to the MR, "Teachers who are well respected in

the district are asking why they are not included in the action research project. When teachers like _____ express an interest, the superintendent takes notice."

In the fourth year of the project, the third year was successfully replicated. The three-dimensional model of action research became a train-the-trainer model, as shown in figure 16. The fourth dimension is collaborative inquiry, whereby SLMSs became the mentors for classroom teachers with whom they collaborated. The research questions studied centered on problems rooted in classroom practice, as well as in collaborative units. This is not to say that the SLMSs were not conducting their own action research, but action research training has expanded to include a district-wide initiative for teachers. Meanwhile, two new SLMSs have replaced retirees and PRs use the original three-dimensional training model to train new staff.

An Emerging Concept of Authentic Teaching: Authentic Research for Students Too!

The synergy of the three-tiered model described in this study supports the development of authentic teaching as the SLMS's pedagogy: a pedagogy of independent learning that is the unique contribution of the school library program to the academic life of the school. Figure 16 shows the addition of authentic research to the pedagogy of guided inquiry. Authentic research is a specific kind of authentic learning task whereby students conduct research that includes data collection and analysis. SLMSs become mentors to students in a relationship not very different from their mentoring of teachers. The structure of this pedagogy is also similar to that used by the MR in the three-dimensional model (Gordon 1999). In a leadership position, the action research-trained SLMS possesses the skills and confidence to implement such a pedagogy that involves the transference of action research skills to students, who need to learn that doing research is more than finding and reporting information.

A model for authentic teaching includes authentic research (figure 17) that challenges students to: (1) Pose research questions that are central, rather than peripheral, to the nature of the academic disciplines; (2) include data collection as well as information searching in the research process; and (3) employ the investigative methods appropriate to the nature of the academic disciplines (Gordon 1999).

Implications for Information Power Standards

Implicit in the methods of evidence-based practice as discussed in this paper is the need for an explicit set of standards that address authentic student research as a vital element of knowledge construction. While information-centered standards of Information Power (American Association of School Librarians and Association for Educational Communications and Technology 1998) are important, especially in the digital age of facile retrieval and use, there is a critical need to extend those standards to support knowledge-centered practice that addresses the elements of guided inquiry, e.g., ALTs/assessments, authentic research for students, and action research. Such a paradigm shift brings SLMSs to the core of their schools' mission. It presents opportunities to forge

connections between library and classroom that place the SLMS at the center of teaching and learning. It empowers SLMSs to become leaders in their schools and agents for change in their libraries. And most importantly, this paradigm shift adds rigor to the academic program, helping students to not only construct their own knowledge, but to use that knowledge as a base from which they can advance to critical thinking as defined by Bloom's taxonomy (1956). This is especially urgent in the educational environment of low budgets, high-stakes testing, and accountability.

Action Research as a Tool for Program and Professional Evaluation

When the Londonderry School District decided to revamp their teacher evaluation system, the Library, Media, and Technology department was at the end of their second year of the action research project. A district-wide committee presented their draft, after a year of study (2003-04), in order to pilot the new teacher evaluation system the next year. The members of the Library, Media, and Technology department reviewed the instrument, which was really focused on the performance of classroom, content-area teachers. They recognized that they had the opportunity to use it as a springboard for the development of a system of evaluation of SLMSs, as well their programs.

The Administrative Council, comprised of the superintendent, assistant superintendent, program directors, business administrator, and human-relations manager, agreed that the emerging role of the SLMS was not addressed sufficiently in the instrument for teacher evaluation. The director of Library, Media, and Technology and the special-pupil services director were charged with developing systems and instruments that were appropriate for the specialized services their professionals delivered. Thereafter, a sub group of SLMSs worked on adapting the district template and incorporating the similarities with teachers, as well as the distinctions and all of the lessons learned as a result of their action research experiences. As a department they worked their way through a number of drafts and iterations and in the spring of 2005 finalized the system.

The director thought that revision of the SLMSs' performance evaluation was timely because the district uses frameworks articulated by Danielson and McGreal (2000) for teacher evaluation in the form of four domains: Planning and Preparation; the Classroom Environment; Instruction; and Professional Responsibilities. These remain the same in the Library, Media, and Technology evaluation document, with the exception of the second domain, which is now the Library Media Center Environment. While many of the elements and the components of these domains remain the same, some have been adapted to the role of the SLMS when they differ from the teacher's role. All elements and components represent principles of best practice in teaching and school librarianship. Each domain has specific measurable components to evaluate performance and it is expected that an SLMS's professional development goals reflect the elements of these evaluative criteria (Londonderry 2005). The evaluation process involves self-evaluation, conferencing, and goal-setting and development of a three-year plan for growth. According to the evaluation document, the SLMS seeks out opportunities for professional development through professional reading, memberships, conferences, and action research (Londonderry 2005). This evaluation system includes the use of artifacts and

other evidences and is really a portfolio system. The director feels that her department has been influenced by their action research experiences to move in this direction.

The director stated the following to the researcher:

> I think there is a definite link to the action research project. I think we intuitively knew that our program and our performances needed to "kick it up a notch." Something was not quite right [instructionally] and we knew, it but could neither put our finger on it, nor articulate it. The action research helped us to get at instruction at a deeper level and to articulate what was missing (i.e., real data-driven reflection and subsequent intervention) and thus actualize improvement. A case, I think, of our being ready to learn and be open to the process--serendipity, I guess. Where we were, and where you proposed to take us, matched up.

Londonderry's evaluation system brings program and performance evaluation together: goals and outcomes for program development constitute identified targets, or problems, the collection of evidence to address the problems, and action plans for improvement. The performance of the SLMSs is anchored in the management of this process. They are empowered as change agents for their programs and as their own best critics of their performance, not unlike their students whom they empowered through ALTs and assessments.

Implications for Library Education

School library education has made great strides in preparing school librarians for their place in twenty-first century schools in the last thirty years. The shift from teaching library skills in isolation to teaching information literacy through an integrated process approach has linked the program with school missions and curricula, raising the library media center to a new level. Library impact studies have heightened awareness of the contributions of vital components of the library media program to student achievement. The promotion of reading and integration of technology have emerged as the cornerstones of resource-based learning. The school librarian-as-teacher defines the profession as teaching and learning upstage support services. Kuhlthau's (1986) ISP and the establishment of constructivism as the theoretical framework for best practice (Kuhlthau 2003) have paved the way for evidence-based practice (Todd 2003) that sets high standards for data-driven decision-making and accountability as the profession meets the challenges posed by tight budgets, digital-learning environments, and high-stakes testing. The model for authentic teaching is the logical next step in curriculum development for pre-service SLMSs. It provides a method that actualizes the paradigm shift from an information-centered library media instructional program to a knowledge-centered one (Todd 2003), as discussed in the beginning of this paper. Future research is needed to expand the repertoire of guided inquiry and refine authentic teaching method that will enable the next generation of SLMSs to realize a critical goal of the school library profession: helping students to learn how to become life-long, independent learners.

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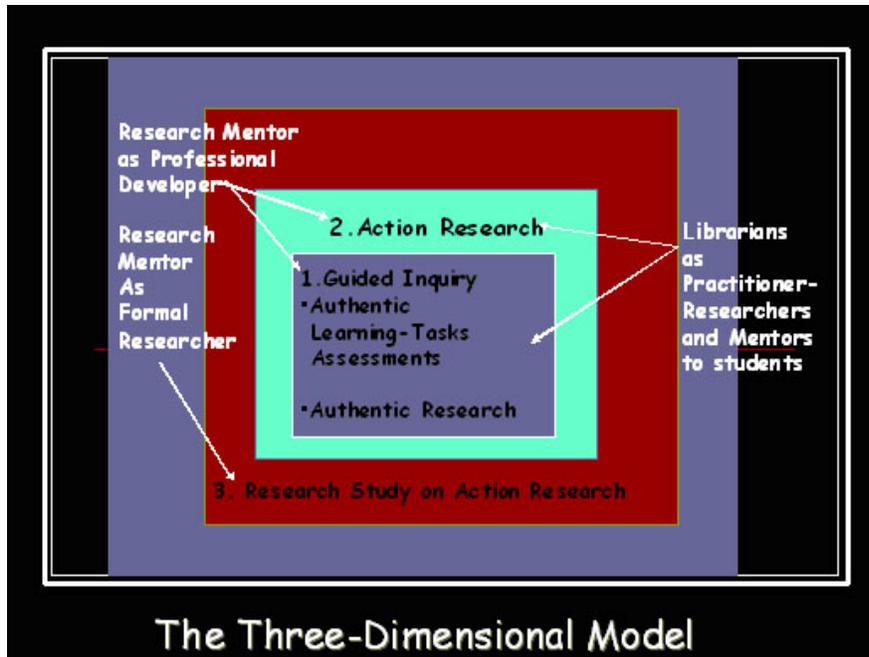
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Figure 1.
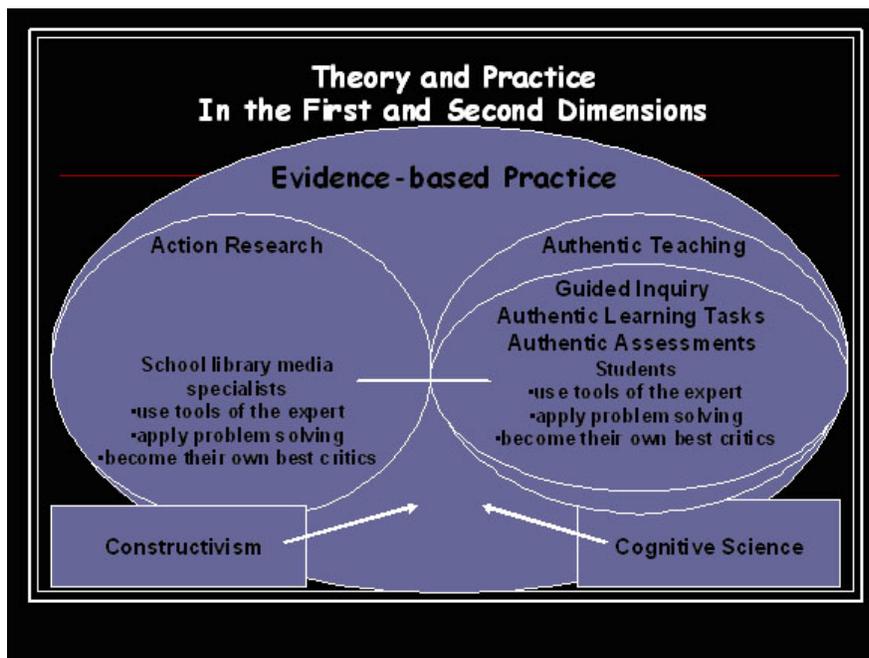
The Three-Dimensional Training Model for Action Research

Figure 2.

What is Action Research?
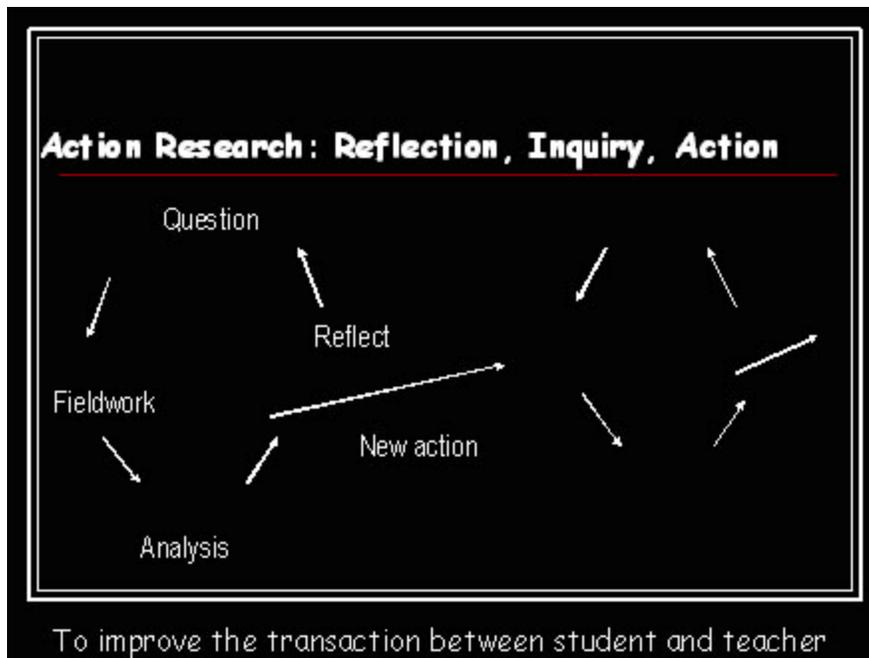
Figure 3.

Theory and Practice in the First and Second Dimensions

Figure 4.

Conceptual Framework for the Three-Dimensional Model

Conceptual Framework for the 3-Dimensional Model
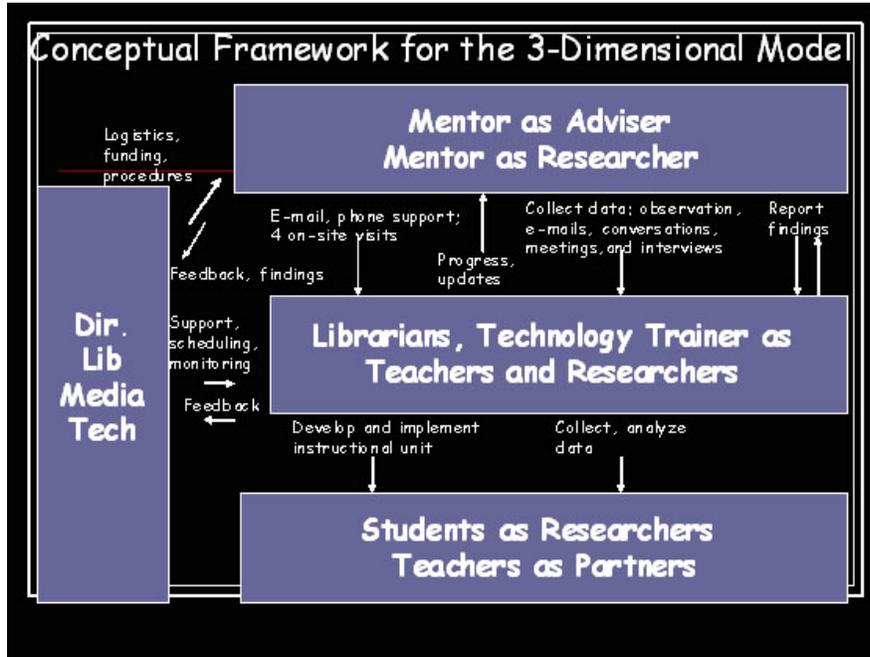
Table 1.

Criteria for an Authentic Learning Task

Content	Method	Design
The task: • is meaningful, academic • relates to internal and external learning standards • uses tools of the expert • requires problem solving, decision making • culminates in a summative assessment based in whole or part, on display, presentation, and sharing of	The learner: • uses prior knowledge, experiences • applies information to new situations • uses divergent, critical thinking • engages in a variety of tasks • has choices	The design: • includes clear expectations and outcomes • provides exemplars • identifies resources • offers assessment tools appropriate for the task • includes learners in the development of

| outcomes | • uses ongoing formative assessments that offer opportunities for self-evaluation, peer review, and revision | the assessment |
| | • has opportunities to work in groups | • includes input from learners and teachers for task evaluation and revision |

Figure 5.

A Model for Authentic Teaching
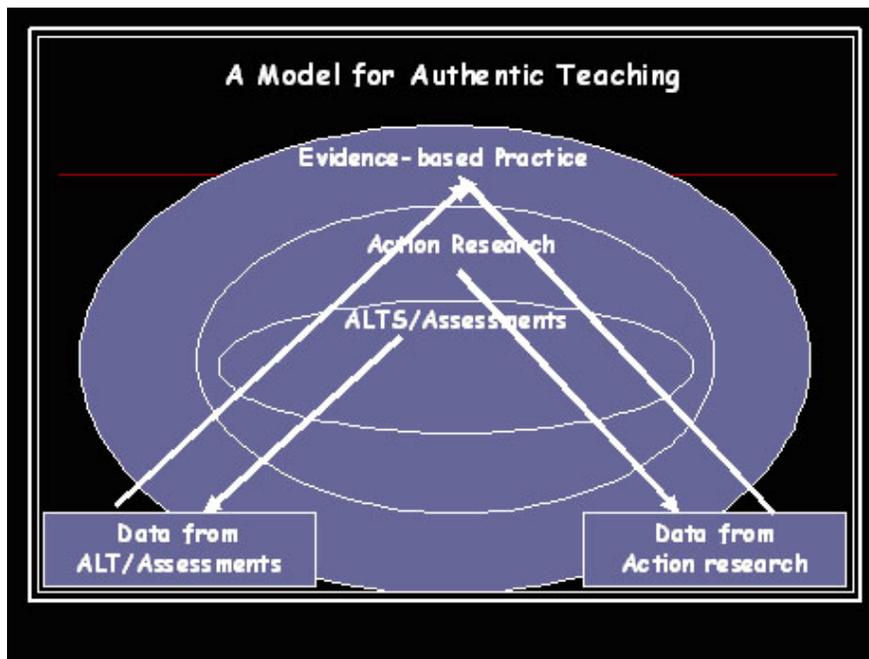
Figure 6.

The Template for the PRs' Proposals

```
PROPOSAL FOR ACTION RESEARCH SUBMITTED BY: (PR)
1. Research question or hypothesis stated as a question

2. Area of Investigation (e.g., Instruction, Library Management, Public Relations)
     a.   Topic _____

     b.   Teacher collaborator (if needed) _____

     c.   Timelines
              Start _____
              End: _____

     d.   Description of the project or unit. Please include information, such as what is suggested
          below, to provide enough data so that someone could replicate your unit. For example,
          Student product? Information/research skills stressed/assessed? Assessments? Lessons
          taught? Support materials used?

How will this investigation improve your practice?

3. Data Collection
Two types of evidence (e.g., interviews, questionnaires, grades, observation/journal entries,
photographs, student products/projects
```

Figure 7.

Kuhlthau's Model of the Information Search Process

The Information Search Process

	Task Initiation	Topic Selection	Prefocus Exploration	Focus Formulation	Information Collection	Search Closure	Starting Writing
Feelings	uncertainty/ doubt	optimism/ confidence		confusion/ frustration	clarity	sense of relief	satisfaction/dis-satisfaction

Thoughts   ambiguity------------------------> specificity
                                   increased interest------>
Actions   seeking relevant information----------------->seeking pertinent information

Figure 8.

Model "How Can I Do It Better Next Time" Questionnaire for Students

Circle number 1 if you strongly disagree, number 2 if you disagree, number 3 if you agree, and number 4 if you strongly agree.

1.	Time lines were reasonable.	1	2	3	4
2.	Instructions were clear.	1	2	3	4
3.	Library resources were adequate.	1	2	3	4
4.	I could get help when I needed it.	1	2	3	4
5.	I felt well prepared to search for information.	1	2	3	4
6.	Bibliography charts were helpful.	1	2	3	4
7.	Graphic organizers for note taking were helpful	1	2	3	4
8.	The list of key words was helpful.	1	2	3	4
9.	Grading (50% for information literacy/research skills and 50% for content) was fair.	1	2	3	4
10.	Now I understand the difference between the Internet and a library.	1	2	3	4

11. What were the best things about this project?
12. What would you change?
13. What was the most difficult task? Why do you think it was difficult?
14. How was this project different from others you have done?
15. Do you think this project was worth the class time allotted? Why? Why not?

Other comments:

Table 2.

Help Sheet for Constructing a Questionnaire

Questions	Ansswers
What is a questionnaire?	A set of questions presented to a group (usually a sample rather than the entire group.) See "How Can I Do It Better Next Time?"
Is a questionnaire the best way for you to collect your data?	• Do you have 5-10 questions that you would like to ask 10-20 people? • Do you want to compare how answers are the same or different for subsets in your sample (e.g., gender, age) • Do you want to quantify (count) responses to look for patterns? • Do you want to analyze respondents' comments to look for patterns?

What kind of sample should you use?	1. **Random sampling**
	    a. Decide how many respondents you need for your sample. (Suggestion: 20% of the relevant universe.)
	    b. Determine the relevant universe (population.) For example, all high-school students.
	 2. **Select a sample where all candidates have the same chance of being selected.**
	 For example, you want to survey students to determine how they feel about the ban on smoking planned for 1999. You might choose 40 people by placing names of all students in a hat and picking 40 names.
	 3. **Stratified random sampling**.

	Decide how many respondents you need for your sample. (Suggestion: 20% of the relevant universe.)
	4. **Select a sample where you can create subgroups with equal representation.**
	For example, you want to survey students by grade level to see how they feel about the ban on smoking and whether there are any patterns in the data that show relationships between grade level and attitude toward the smoking ban. You might choose 10 people from each grade level at random from class grade level lists.
	5. **Systematic sampling**
	a. Decide how many respondents you need for your sample. (Suggestion: 20% of the relevant universe.)
	b. Make a list of the names in the population, choose one at random, and count down every 4 or 5 names to choose those in the sample. For example, you want to survey all students to determine how they feel about the smoking ban. You might get a list of students, choose the 2nd or 3rd name as the first in the sample, and count down every 4th name until you get the number of names you need in your sample.
	6. **Cluster sampling**
	a. Decide how many respondents you need for your sample. (Suggestion: 20% of the relevant universe.)
	b. Divide the population into small groups (clusters) and randomly sample the clusters. Include every person or household in each sample cluster. For example, to survey a city, divide it into blocks, randomly sample the blocks, and include every house on each sampled block in the survey.
How do I write the questionnaire items?	1. Determine characteristics of your respondents that you want to identify (e.g., gender, age, nationality, experience). Provide a place at the top of the questionnaire to collect this information or use a Respondent Profile Sheet.
	2. Decide if you are using closed or open questions, or both. Closed questions ask the respondent to choose from given answers; open questions ask the respondent to write in their replies.
	3. Decide what you want to know. Use your research question and sub-questions. Write your questions.
	4. Decide how respondents will reply to the questions. For example, you might want to use a Likert rating scale where the respondent chooses a number from 1 to 4: 1 means strongly disagree; 2 means disagree; 3 means agree; 4 means strongly agree.
	5. Write instructions explaining the rating scale at the top of the questionnaire.
	6. Funnel your questions. Start with the general and move to the more specific.
How do I refine my questionnaire?	1. Pilot (test) your questionnaire using at least 3 respondents.
	2. Make changes according to the results of the pilot questionnaire. For example, you may want to make a question clearer, add a question, or change your sample if all the respondents answered all the questions the same way. Use "Traps to Avoid" to determine whether any of your questions are faulty. Revise faulty questions.
	3. Use Standards for Validity and Reliability to revise questions that do not meet these two standards.
	4. Can your questionnaire be used without help? Edit your questionnaire for readability and clarity.
	5. DO NOT ADD NEW QUESTIONS AFTER THE PILOT.

Traps to Avoid: What are common errors made when writing questions?	• Double question: Do you walk to school or carry your lunch? • Wrong-choice question: Is your hair yellow, purple, green, or blue? • The kitchen-sink question: Please list all the schools you have attended, your teachers, and what grades you got. • The fuzzy-word question: Should middle-aged people live it up? • The cover-the-world question: What do you think of racism? • Jargon questions: Do you feel your cognitive and affective domains have been adequately addressed in school? • Dream questions: What kind of education would you like for your child? • Leading questions: Why are you happy at this school? • Hearsay questions: Do you think students are happy at this school? • Assumptions: Why did you choose this school?
What are the standards for validity and reliability?	• **Validity:** Do your questions measure what you want them to measure? Do they produce answers that accurately reflect the respondent's beliefs, experiences, or situation? • **Reliability:** Do the questions and answers have consistency and reliability? Consistency: Are the questions and answers consistent and repeatable? Will the same question asked of the same person in similar circumstances produce the same answer? • **Repeatability:** If the same questions were asked in different ways, at different points, would the answers be the same?
How do I administer the questionnaire?	• Get informed consent from each respondent. • You must decide on a method of distributing and collecting the questionnaires that will ensure that you get back as many as possible. Your return rate could be very low if you leave it to chance. Suggestion: if possible, stay with the respondents while they fill out the questionnaire. If this is not possible, send out twice the number of surveys that you need to be returned. • Stay in control of your sample: do not let anyone participate who has not been chosen for the sample.

How do I analyze the data?	1. **Quantifying and categorizing (grouping) data**
	   a. Count the responses for each question or category of questions. For example, if you used the Likert rating scale, count how many people answered 1, 2, 3, and 4 for each question.
	   b. Make a table or graph to display the data. Discuss the results in your paper and include the display.
	   c. Find the mean (average), the mode (the most frequent answer), or the median (the middle answer) for each question, or for questions you want to discuss more fully in your paper. These can also be displayed in a table.
	2. **Color coding and categorizing data**
	   a. Look for patterns or trends (for example, words that have been repeated by several different respondents in open-ended questions) and highlight the words. Use different colored highlighters for different ideas or categories (groups) of data. Use your sub-questions for ideas for categories. Look for relationships between characteristics of the respondents (age, gender, nationality, experience) in the Profile and the responses given.
	   b. Discuss the trends or patterns you observed in the data in your

	paper. Use quotations as the display of data.

Figure 9.

Example of a Respondent Profile


```
GENDER
Male                                                        Female

AGE
13    14    15    16    17    18

COUNTRY OF BIRTH        _____
English-speaking Country    Yes    No

ENGLISH
First language                                    Second language

NUMBER OF SCHOOLS ATTENDED SINCE AGE 5
1    2    3    4    5    more than 5
```

Figure 10.

Help Sheet for Constructing an Interview

How do you conduct an interview?

1. Select the type of interview you will do.
Standardized schedule interview (the interviewer has prepared, written questions)
a. The same information is required of each person and each is asked exactly the same questions in the same order.
b. Questions are a type of questionnaire (See Help Sheet for Questionnaires.)
c. Use this type for interviewing a larger number of people.
d. Use this type of interviewing for respondents who share the same characteristics or outlooks.
e. Data will fall into neat categories for analysis.
Standardized interview, no schedule (questions are written as a guide but not strictly followed)
a. Different questions or kinds of questions, perhaps put in a different order, are necessary to get the same information from different people.
b. Data will cover more material and will not fall into neat categories.
c. Interviewer has a research outline that helps him/her remember the points to be covered.
Unstructured interview (no written question or guide since these data are collected at the beginning of the research.) THIS METHOD IS NOT RECOMMENDED FOR THE GRADE 10 PAPER.
a. There is no set order of wording of questions, no schedule (written questions).
b. Different information is needed from different respondents.
c. Data will cover more material and will not fall into neat categories.
d. Data will be used for formulating the research question(s) and limiting the research.

2. Write the interview questions
a. Determine characteristics of your respondents that you want to identify (e.g., gender, age). Provide a place at the top of the questionnaire to collect this information or use a Respondent Profile Sheet.
b. Decide if you are using an interview schedule (written questions) or a research outline.
c. Decide what you want to know. Use your research question and sub-questions.
d. Write your questions.
e. Funnel your questions. Start with the general and move to the more specific.

3. Revise the interview questions
a. Pilot (test) your questionnaire using at least 2 respondents. Tape the interviews.
b. Listen to the audio tapes.
c. Make changes according to the results of the pilot interviews. For example, you may want to make a question clearer, or change your sample if all the respondents answered all the questions the same way. Use Traps to Avoid to determine whether any of your questions are faulty. Revise faulty questions.
d. Use Standards for Validity and Reliability to revise questions that do not meet these two standards.
e. DO NOT ADD NEW QUESTIONS AFTER THE PILOT.
[Ed/Au: rather than repeat the Traps to Avoid, consider adding "table 2" after "Use Traps to Avoid" above.]

Traps to avoid when writing your questions
- Double question: Do you walk to school or carry your lunch?
- Wrong-choice question: Is your hair yellow, purple, green, or blue?
- The kitchen-sink question: Please list all the schools you have attended, your teachers, and what grades you got.
- The fuzzy-word question: Should middle-aged people live it up?
- The cover-the-world question: What do you think of racism?
- Jargon questions: Do you feel that your cognitive and affective domains have been adequately addressed in school?
- Dream questions: What kind of education would you like for your child?
- Leading questions: Why are you happy at this school?
- Hearsay questions: Do you think students are happy at this school?
- Assumptions: Why did you choose this school?

Standards for Validity and Reliability
Validity: Do your questions measure what you want them to measure? Do they produce answers that accurately reflect the respondent's beliefs, experiences, or situation?
Reliability: Do the questions and answers have consistency and reliability? Consistency: Are the questions and answers consistent and repeatable?

Figure 11.

Data Collection Schedule

December:	Site visit #1: Introduction to Action Research Part 1
	Group instruction for director of Library, Media, and Technology and SLMSs and Technology Integrationist
	Focus: An overview of how action research works and why we use it
January:	Site visit #2: Introduction to Action Research Part 2
	Focus: Introduction to ALT and assessments as data-collection tools and the proposal (topic, ALT and assessments, research question, data collection)
January-April	E-mail correspondence with all PRs and director of Library, Media, and Technology
	Focus: The stages of the action research project: designing the ALT, writing a proposal, formulating a research question, collecting data.
February	Site visit #3: Individual meetings, interviews with PRs and director of Library, Media, and Technology
	Focus: The implementing the ALT, refining proposals, and collecting data.
April	Site visit #4: Individual meetings, interviews with PRs and director of Library, Media, and Technology
	Focus: Data collection and analysis and preparation for the state conference presentation.
May	Presentation by PRs, the director, and MR at a state conference
	Focus: Methodologies and findings of the PRs.
June	Site visit #5: Debriefing at Library, Media, Technology department meeting
	Focus: Evaluation of the action research model and findings of the PRs.
	Board presentation by MR
	Focus: The action research model and findings of the MR.

Table 3.

Guiding Questions for Debriefing of Action Research

1. What suggestions do you have for improving the way the action research project was structured, presented, and implemented? (This question relates to what the MR should change in order to do this better next time.)
2. If you could do your action research project over again, how would you do it differently? What changes would you make? Why? (This question relates to what you would change in order to do this better next time.)
3. Would you use the action research methods you learned again? Why or Why not?
4. What other question(s) would you like to explore related to library instruction in future action research studies?
5. What other areas of your practice would you like to study?
6. If this action research project helped you to plan and implement instruction, how did it help? If it didn't help please state why.
7. What was the most difficult aspect(s) of doing action research?

Table 4.

E-mail Transactions between the Director
and the MR

	From Director to MR	From MR to Director	Totals
No. of e-mails	15	14	29
Total words	1,434	2,637	4,071
Categories	11 Logistics	5 Logistics	16
	3 Strategies	8 Strategies	11
	1 Evaluation	1 Evaluation	2

Figure 12.

Planning the Action Research

Figure 13.

E-mail and Average Word Counts
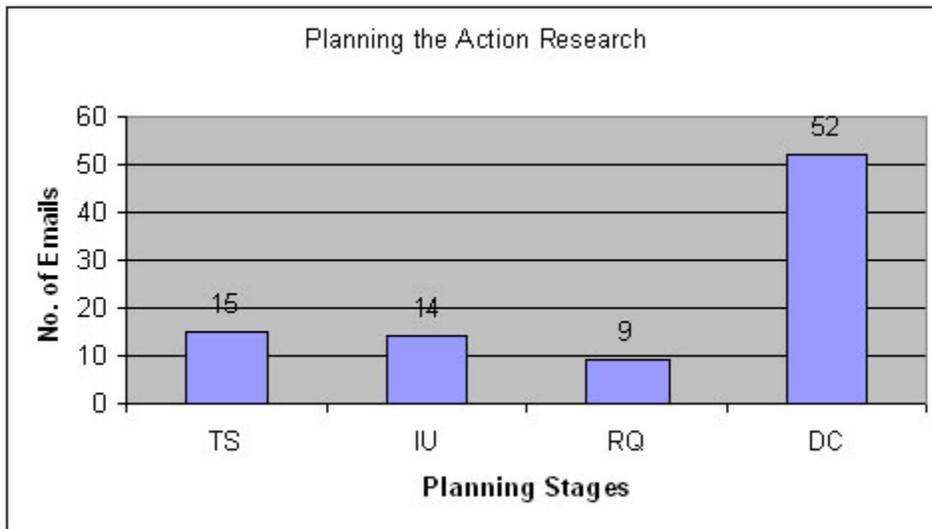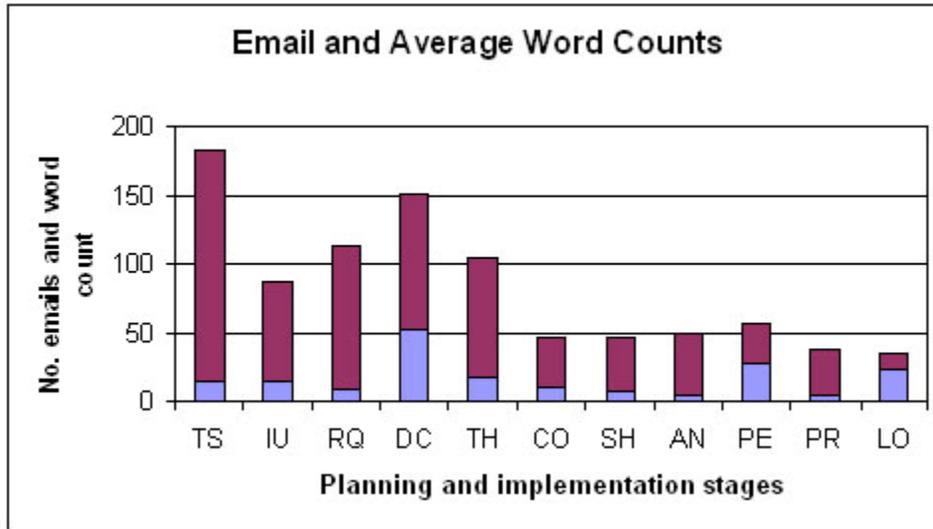
TS =Topic Selection; IU=Instructional Unit; RQ=Research Question; DC=Data Collection; TH=Theoretical Framework; CO=Collaboration with teachers; SH=Sharing among PRs; AN=Analysis; PE=Praise and Encouragement; PR=Progress; LO=Logistics

Table 5.

Task Initiation, Topic Selection, and the Research Question

| Research Stages	Elementary PRs (3 SLMSs)	Middle PRs (2 SLMSs)	High PRs (2.5 SLMSs; 1 technology integrationist)
Task Initiation/Topic Selection	Developed topic-based curricular topic for unit of inquiry for	Developed topic based on what they wanted to know about	Developed topic based on students' information-seeking behaviors

	students (penguins, black history) and on student skills (critical thinking) 13 e-mails/880 words	their teaching: "What do we really need now regarding teaching note taking?" 5 e-mails/789 words	(plagiarism, poor note taking, under-use of subscription databases, and improving student writing.) 9 e-mails/1,614 words
Stating the Research Question	Developed focus on what they wanted to know about student learning (higher levels of thinking) 13 e-mails/880 words	Developed focus on student information skills (Which method of note taking will student choose when given a choice?) 5 e-mails/780 words	Developed focus on problems (plagiarism, poor note-taking skills, under use of subscription databases) and solutions (technology and writing improvement). 10 e-mails/1,110 words

Figure 14.

Implementing the Action Research
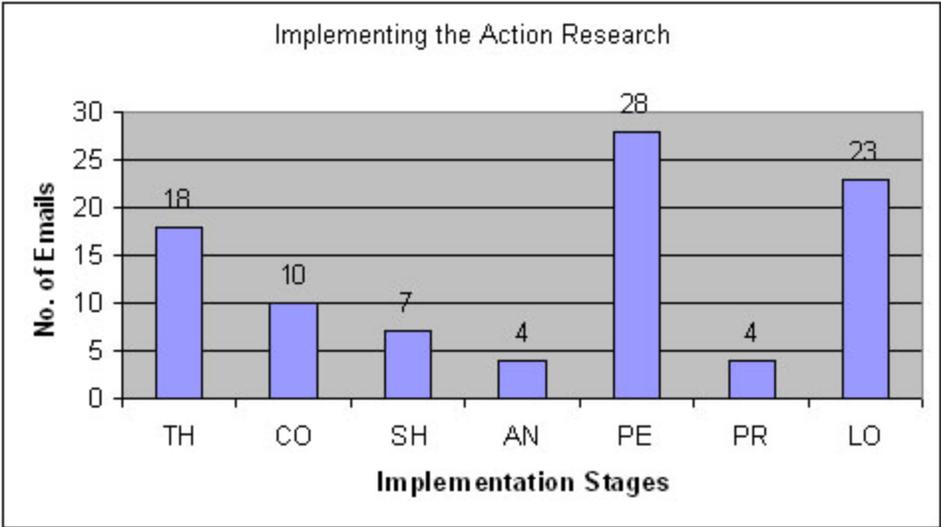
Implementing the Action Research

TH=Theoretical Framework; CO=Collaboration with teachers; SH=Sharing among PRs; AN=Analysis; PE=Praise and Encouragement; PR=Progress; LO=Logistics

Table 6.

The Role of a Theory and External Sources in Action Research

Source	Reasons for Use of Source	
		Data Collection
Sternberg		Find test for learning styles Action research study design
Skinner		Data collection (control group)

ERIC		Data collection ideas		
		Data Analysis		
Bloom		Taxonomy of thinking skills		
Piaget		Stages of cognitive development		
		Authentic Learning Task Design		
Grant Wiggins		Authentic assessments		
Ross Todd		Web evaluation		
Kathy Schrock		Web evaluation		
Ruth Small		Evaluation skills		
Vygotsky		Meta-cognition; social learning		

Level	No. of E-mails	Word Count	No. of E-mails	Word Count
Elementary	4	205	19	1,371
Middle	3	708		
High	12	458		

Table 7.

Methods of Analysis in Action Research

Method of Analysis: Look for...	What it means
Comparing (Similarities)	How are things alike?
Contrasting (Differences)	How are things different?
Constructing support	What is the support for the argument? What are the limitations of it?
Classifying/Labeling (Categories)	How can I put things in groups? What are the rules governing membership in these groups? How can I name the groups?
Structural Analysis (Main idea/supporting evidence)	What is the most central idea? What is the evidence to support what you say about main idea?
Induction	What conclusions, generalizations can you make and what is the support for

	them?
Deduction	What is the proof that this must be true?
Chronology by time or stage	How can I arrange data in time order or by stages or steps?
Pros/Cons	What are the arguments in favor of and against a point of view?
Causes/Effects	What were the reasons and results of an event?
Problems/Solutions	Why doesn't something work and how can we make it work?
Procedures/Experimental inquiry	What are the steps involved in doing something? What do I observe? How can I describe, explain it?
Relationships (Spatial, Human)	What does one thing have to do with another?

Analyses	How can the subject be divided into significant parts?

Figure 15.

Guidelines for Conference Presentation

Guidelines for Conference Power-Point Presentations

1. Handout: Title of your study (this can be the essence of your research question, e.g., "Why are high-school students reluctant to use electronic subscription databases?" Be sure to identify the level: elementary, middle, or high school.
2. Your name.
3. One page abstract of the study (about 100–150 words) including: the research question in terms of what you wanted to find out about your teaching and why you wanted to research this idea. Include "How can I do it better next time" as the broad research question.
4. A brief explanation of the instructional unit.
5. Data-collection methods.
6. How you analyzed the data.
7. Your findings.
8. How the findings will inform your practice.
9. Further research you would like to pursue.
10. Visuals: These may be overhead transparencies or computer projects. Any tables or diagrams that summarize findings would be useful.
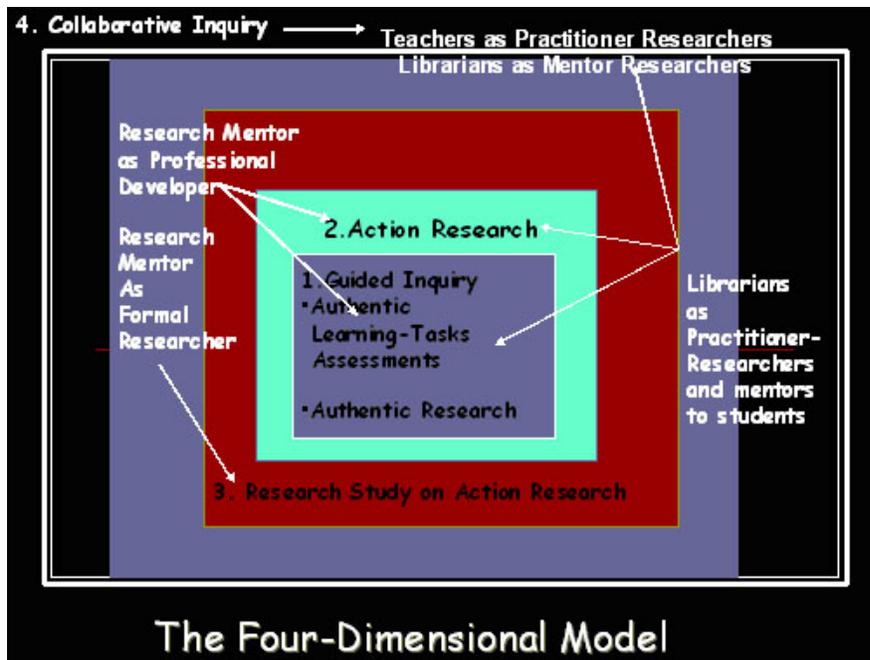
Note: The information in your proposal and other papers you have prepared as part of the research contain most of this information.
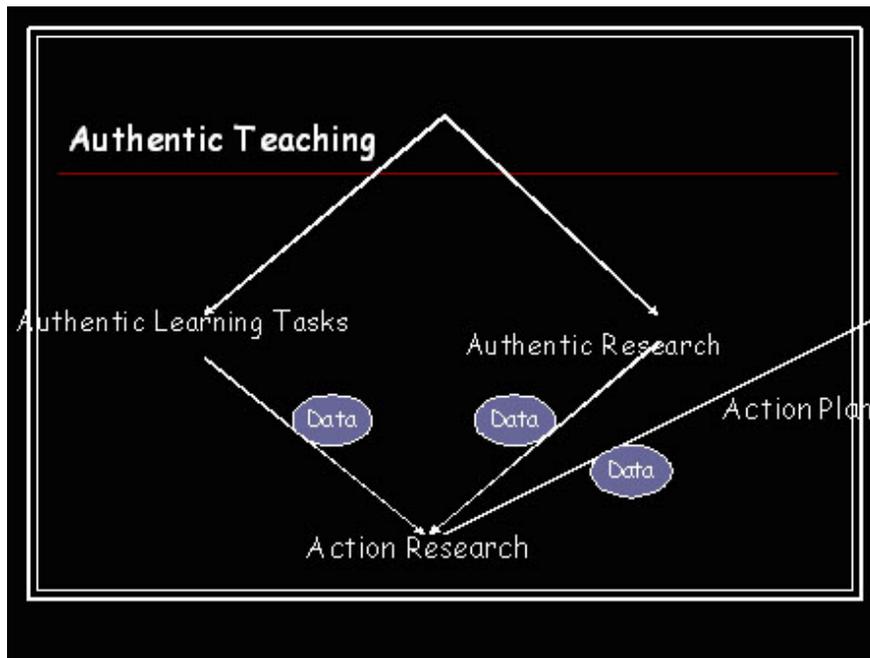

Figure 16.

The Four-Dimensional Training Model

The Four-Dimensional Model

Figure 17.

Authentic Research for Students Too!