School Library Media Research
Research Journal of the American Association of School Librarians

Volume 2, 1999
ISSN: 1523-4320

Approved October 1999
www.ala.org/aasl/slr

Students As Authentic Researchers: A New Prescription for the High School Research Assignment

Carol Gordon, Head, Educational Resources Library, Boston University

Can tenth graders go beyond writing reports to conduct "authentic" research? English teachers and the school librarian collaborate to gather data in a qualitative action research study that investigates the effectiveness of an assignment that requires primary research methods and an essay of two thousand words. The unit is designed as a performance-based assessment task, including rubrics, student journals, and peer editing. Students develop research questions, write proposals, design questionnaires and interviews, and learn techniques of display and analysis. Concurrently, their teachers gather data from observation, journals, and questionnaires to determine the strengths and weaknesses of the assignment. The research assignment has become analogous to "Take two aspirins and call me in the morning." It doesn't seem to do any harm and may even do some good. Educators adjust the dosage for older students: the length of the paper grows with the time allotted to the task but the prescription is the same. It is universally accepted as a benign activity, as evidenced by the prevalence of standards and objectives for research skills in school curricula. It has become a staple in the educational diet of the high school student. Librarians promote the research assignment because they want students to get better at searching, retrieving, and evaluating information. English teachers see it as an opportunity for sustained writing. Parents like it because it is good preparation for college. Everyone likes it because it gets students into the library and reading. So, what is wrong with research as it is traditionally taught in secondary schools? And what do students think?

What's Wrong with the Research Assignment?

Figure 1 presents a typical assignment, which is a composite of assignments from the author's experiences. The instructions address format and mechanical aspects of the research paper. Students are asked to choose from a list of topics, all of which are outside traditional classroom curricula but are typical of "high interest," controversial topics. The assignment requires students to apply critical thinking skills, that is, comparing and contrasting. Why is this assignment faulty in its design?

Figure 1. A Typical Research Assignment

Write a research paper on one of the topics listed below. Your paper should be 2,000 words and include cover page and table of contents, an introduction, body and conclusion. Use at least three

sources of information, both print and electronic, and include at least three quotations with correct citations and a bibliography. Your paper should include two points of view on your subject with evidence to support both viewpoints.

Gays in the Military	**Abortion**
Drug Abuse	**Cloning**
The Vietnam War	**Capital Punishment**
Gun Control	**AIDS**
Sexual Harassment	**Homelessness**
Environment	**Eating Disorders**

The pure sciences have traditionally incorporated research methods with content teaching in their classrooms and science labs. History papers also reinforce the particular methods of their discipline by directing students to primary sources and appropriate methods of analysis, such as cause and effect. The research assignment found in figure 1 is usually viewed as a function of the English class: it presents independent student work as an external exercise for the purpose of learning how to write a paper. It does not aim to expand a student's knowledge in an academic school subject or to teach methods of investigation specific to an academic discipline. The typical assignment does not stress methodology that ensures reliability and validity of results. It does not provide opportunities for the collection of data, whether it be quantitative or qualitative, that places the student-as-researcher in a learning environment outside the world of text and into the real world of phenomena.

For example, conducting an interview, administering a questionnaire, or keeping a journal based on observation would place students in an active role of collecting data and constructing meaning. The typical assignment does not require students to do research, but to report and reflect on the facts and findings of others and to draw conclusions based on reading. When we look at the methods of the experimental scientist working in a laboratory, or the methods of a social scientist using participant observation to gather data about a cultural phenomenon, there are rigorous standards in place to ensure the validity and reliability of results. With the push toward relevance in our teaching and authenticity in our assessments of student knowledge and skill, it makes sense to elevate our expectations of independent student work from the level of reporting to standards of research as it is practiced by real researchers.

Symptoms and Side Effects of "Reporting" Overdose

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. Reporting has masqueraded as researching for so long that the terms are used interchangeably. In a study that interviewed ninth graders as they worked through a research assignment, one student revealed that, "Students' perception of doing research was writing a

grammatically correct report that was well-presented and provided other peoples' answers to someone else's question" (Gordon 1996, 32). 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 was a test; creativity and inquiry were not perceived as part of the process and grades were perceived as the most important measure of success (Gordon 1996).

Implicit in the typical report assignment is an underestimation of what students can do, sending a clear message to them that they are passive recipients of information. Teachers are often disappointed with results, especially when confronted with plagiarism. It has been suggested that students plagiarize because they are taught to do research under a faulty instructional model that is linear (Davis 1994). A step-by-step approach—choosing a topic, narrowing that topic, locating information, taking notes, organizing notes, writing the paper (Kuhlthau 1984)—oversimplifies complex thinking processes that are idiosyncratic and reiterative, driven by the need to know. Even when there is no intent to copy "word for by word," many papers are the product of cutting and pasting information: they contain little creativity and virtually no discovery that has been tested, analyzed, and internalized by the learner. These are assignments that can be easily subverted: students can purchase research papers from Internet sites.

While "doing a report" is an appropriate fact-finding exercise for short-term assignments, it has been overprescribed, eating up time for learning the investigative methods used by researchers in the real world. Does "doing research" have to be limited to highlighting photocopied text from books and magazine articles and printing out from Internet sites or CD-ROM databases? Can students successfully use primary research methods to collect their own data? What if teachers and librarians designed research assignments that distinguished between information and data—that is, between facts and ideas recorded in books and electronic sources—and evidence, or data, collected first-hand by the student-researcher? What if teachers and librarians became reflective practitioners who saw the research assignment as an opportunity to gather data, share, and analyze data in order to evaluate and revise the learning task?

What the Literature Tells Us

This study aimed to expand the concept of student research beyond the four walls of the classroom and of the school library. It also addressed the classroom/library dichotomy that resides in the perceptions of students and teachers. The research that informs this study, then, was rooted in the constructivist theory of learning as it has emerged in educational research, as well as in school library and information retrieval studies. Each of these research fields has a substantial body of research that rests on a cognitive psychological view of learning and information gathering that is user- or learner-centric.

This is a critical prerequisite for building a framework for independent student work such as the research assignment. The concept of student-as-researcher derives from constructivist learning theory rather than the transmission approach implied in behavioral theory (Richelle 1995). The belief that behavior could be shaped by reinforcing, or rewarding, desired responses to environment led educators to devise steps to help learners achieve desired behaviors, or learning outcomes. Behavioral approaches, with step-by-step directions, do not accommodate the complex thinking processes required for doing research. Cognitive learning theory states that knowledge acquisition occurs "when learners consciously and explicitly tie new knowledge to relevant concepts or propositions they already possess; idiosyncratic knowledge acquisition

requires association of new knowledge with what learners already know" (Ausubel 1963). Kuhlthau (1997) states, "Constructivist type of learning is transferable to situations in the real world. Students learn to think through issues that do not have prescribed responses or preset solutions. Students learn to identify what is important to them, to construct new meanings, and to explain their new understanding to others in some way that is authentic to the topic" (711). Cognitive theory supports a more flexible model for student research that allows for reflexivity and the idiosyncratic nature of thinking.

Changes in classroom methodology in this century also reflect a paradigm shift from a behavioral model of rote learning that reflected a traditional, essentialist philosophy that was content-centered to the student-as-active learner (Bruner 1960). Building on Kelly's theory of constructs (1963), Ausubel (1963) hypothesized that, in order for meaningful learning to occur, new information must be linked to pre-existing knowledge. The distinction between rote-meaningful learning and reception-discovery has supported pedagogy that requires active learning. Rote learning is verbatim, involving externally dictated stimulus response associations, while meaningful learning is idiosyncratic, requiring the association of new learning material with what the learner already knows (Ausubel 1963).

Piaget (1928) described schemata—mental structures by which individuals organize their perceptions into categories to classify specific information—laying the groundwork for constructivist theory. These schemata adapt during the learning process through assimilation, by which the learner integrates new information into existing schemata, or by accommodation, whereby existing schemata are modified to create new mental structures. Piaget's assumption that the individual is a critical thinker from birth laid the foundation for later research in cognition (Kulleseid 1986) and the movement toward teaching critical thinking skills.

Another initiative that promotes active learning, the problem-solving approach, dates back to the work of Bloom and Broder (1950). Identifying four categories of problem-solving behavior was useful in discriminating between the problem-solving behavior of successful and unsuccessful students: successful problem-solvers question their knowledge and use that information to break the problem down into more manageable components.

Trends in information retrieval research parallel those in educational research. Kelly's theory of personal constructs stated, "a person's processes are psychologically channelized by the ways in which he anticipates events" (1963, 46). The function of a construct is to enable learners to anticipate events and predict outcomes; behavior is based on the predictions they make. Change in behavior is a response to a change in personal constructs. If the prediction proves accurate, the construct is validated; if the predication proves faulty, the construct is reconstructed. The application of Kelly's theory to a search for information is based on the premise that the search process is a process of assimilation and construction involving feelings as well as thoughts (Kuhlthau 1986). Throughout a search for information, users construe and reconstrue the research topic. As users become informed by the information found, their constructs of the topic change (Kuhlthau 1988).

Constructivist theory supported Kuhlthau's (1986) development of a model of the information search process, displayed in figure 2. Information seekers move from uncertainty to satisfaction or dissatisfaction with the way they have handled the search prior and subsequent to focus formulation. Both thoughts and feelings were considered as searchers advanced from seeking

relevant information to seeking pertinent information. When applied to high school seniors, the stages indicated information seeking was a complex learning process that involves finding meaning (Kuhlthau 1989).

Figure 2. Kuhlthau Model of the Information Search Process (ISP)

Stages	Task Initiation	Topic Selection	Prefocus Exploration	Focus Formulation	Information Collection	Search Closure	Starting Writing
Feelings	uncertainty	optimism	confusion, frustration, doubt	clarity	sense of direction/ confidence	relief	satisfaction/ dissatisfaction
Thoughts		ambiguity----------->specificity					
				increased interest----------			
Actions	seeking relevant information----------->seeking pertinent information						

The constructivist approach shifts the focus of the classroom from teacher to student, placing the teacher in the role of a coach (Sizer 1992). Kuhlthau (1997) elaborates on the role of the librarian in supporting students in the information search process (ISP), providing five strategies for coaching: collaborating, continuing, conversing, charting, and composing. These functions are especially helpful in the digital environment that invariably brings information overload and are crucial to supporting the thinking process that underlies an authentic research assignment (see figure 2). A variety of techniques for data and information collection allows opportunities for student-researchers to collaborate with other students as well as with adults, as, for example, in the interview process.

The ownership that students feel for their own data facilitates the process of construction as they struggle for understanding and meaning in the data. Conversing becomes a natural part of the process as students rely on people in addition to print and electronic formats. The charting function of information seeking and data collection emerges when students display numerical, verbal, or pictorial data in figures and tables to assist analytical discussion. Composing becomes an ongoing process, not restricted to the writing of the paper but used as a tool in the process of focusing the topic. For example, stating the research question in a written proposal helps students develop a rationale and methodology for proceeding.

Research in constructivist learning and information-seeking theory points to the need for the practitioner to create learning tasks that relate to the real world and offer opportunities for critical thinking, problem solving, and meaningful learning. Our understanding of the affective, as well as cognitive components of information seeking and learning, point to the need for learning tasks that engage students with other people and invite them to construct their own meaning. Concepts of relevance and information needs, as they emerge from constructivist-based research, suggest that learning tasks must offer diverse opportunities for learning and interpreting information and data. It is clear that a monolithic research assignment, restricted to reading and note-taking as the only methods of discovery and presentation, is not adequate to accommodate the highly personalized model of learning and information searching that cognitive psychology presents.

Testing a New Prescription: Students As Authentic Researchers

Action research was the framework for data collection in this study. In the context of an actual research assignment, teachers became teacher-researchers who evaluated the effectiveness of their pedagogy by observing and collecting data from student-researchers. Hobson (1996) states, "today the idea of 'teacher-researcher' has gained greater value, not only in the educational research community, but also among classroom teachers who realize that investigations conceived, implemented, and evaluated by actual teachers in real classrooms among live schoolchildren promise to better stand the tests of practicality and personal relevance" (p. 1). The concept is rooted in the advice of Dewey (1929): practical inquiry should be the substance of educational research. Action research methodology is rooted in the qualitative tradition, growing out of investigation in the social sciences that gathered data from people engaged in behaviors in natural settings (Bogdan and Bilken 1992).

The value of library and information skills instruction for students is inherent in the concept of school libraries, and one would expect to find abundant current research on this topic. There are a surprisingly limited number of studies that directly focus on questions of impact and worth of library and information skills instruction (Eisenberg and Brown 1992). Collecting data on a particular method of instruction for a particular set of complex skills is problematic: evaluating the effectiveness of a research assignment is difficult to do outside the context of that assignment. Models such as the "Big Six" and the "information search process," and most of what educators know about teaching research skills, have emerged from practice, and there are no formal research studies that tell us one instructional approach is better than another (Eisenberg and Brown 1992). Action research is particularly well-suited for researching these models because it is contextual and rich in verbal data; it lends itself to small samples and elicits data that help to find out "why" and "how" rather than "how many."

The authentic research model used in this study derives from models developed by Kulthau (1986), Eisenberg and Berkowitz (1990), Irving (1985), and Stripling and Pitts (1988). The comparison of these models by Eisenberg and Berkowitz (1992) revealed that the stages identified were basically the same: topic choice, focus, exploration, locating sources, gathering information, applying critical thinking skills to the information, and presenting a final product. Authentic research builds on these models, requiring student-researchers to use primary research methods to collect data, in addition to information from secondary sources.

The "authentic" aspect of this model also derives from the performance-based assessment, sometimes called alternative or authentic assessment. Recent educational developments have questioned the traditional assessment techniques and established criteria and guidelines for alternatives (Wiggins 1992). Traditional pencil and paper tests "are based on views of learning and knowing that are not best suited to the development needs of adolescents," while methods such as concept mapping "provide a rich view of student knowledge" (Dana and Tippins 1993, 3). Other alternative assessments include performance assessments, which require investigation of a problematic situation, simulations, and role playing, all of which can rely heavily on library resources and information skills. Portfolio assessment based on a collection of the student's best work (Collins and Dana 1993), journals, and rubrics are assessment techniques that optimally operate in a data-rich environment. Authentic assessment, or matching assessment strategies to

instructional practices (Powell 1993), includes short- and long-term research projects that require information gathering. Authentic research uses the tools of authentic assessment to evaluate student work and provide feedback for improvement. The model presented in this paper used journal writing and rubrics.

This piece of action research offers a model for practitioners to use with students for two purposes:

1. To design a learning task in the form of a research assignment that would elevate the quality of students' research papers
2. To heighten the awareness of teachers and librarians in their roles as reflective practitioners who use the same research methods they are teaching to their students to assess the design of the assignment and the pedagogy used to implement the unit

The setting for the study was Frankfurt International School in Germany, an independent school that serves employees of multinational corporations and government agencies as well as German families. The school has an enrollment of more than 1,600 students on three campuses. The high school, located on the largest of these, enrolls more than 400 students from more than 50 countries in the world. The International Baccalaureate (IB), adopted by many American schools to add rigor and enrichment to existing curriculum, involves most eleventh and twelfth graders and requires an Extended Essay of 4,000 words. Teachers undertook the study because they wanted to hone students' analytical thinking skills in order to improve exam scores and Extended Essays.

The librarian designed a research unit in collaboration with tenth-grade English teachers. Every six school days, tenth graders attended an "Advisory" class in which the librarian taught one of ten pivotal lessons covering the information outlined in figure 3. (Bold print highlights the distinctive features of an authentic research assignment.) Each lesson focused on a different aspect of doing research and provided just-enough-just-in-time support. Class discussion and examples of good and poor student papers helped students distinguish between reporting and researching and this became a recurrent theme in the unit.

Figure 3. An Authentic Research Assignment

Write a paper of 2,000 words that tells the story of your investigation of a question or problem you are curious about. You will collect information from books and electronic sources that will help you focus your topic and **you will collect data through interviews, questionnaires or content analysis that will be displayed and analyzed as evidence.** The following questions will help you become authentic researchers:

1. **What is research** and how is it different from reporting?
2. What is a **researchable question?**
3. How do I do prepare a **proposal** for my research?
4. How can do we **evaluate our own success as authentic researchers?**
5. Where do I get information?
6. How do I get **data from a primary source?**
7. How do I **display and analyze data?**
8. How do I present my paper using a style sheet?

9. How do we edit and revise our papers using the writing process?
10. How can we **evaluate the success of this teaching unit as authentic researchers?**

The written work that you will submit in an **appendix to your written paper** will include:

1. Proposal
2. A **journal** documenting your progress
3. Your notes from information gathering
4. Your **notes, tapes or videos from data collection**
5. A rough draft of your paper

The second lesson focused on "researchable" research questions, examples of good and poor research questions, and criteria for good questions. The lesson highlighted the necessity of background reading and basic inquiry in the writing of a researchable question. The third lesson addressed writing a proposal that included:

- a researchable question;
- a rationale establishing why the research was important;
- a working bibliography of materials used in background reading and other resources that might be useful; and
- a list of key words and phrases, with definitions, that could be used in searching for information.

Teachers and the librarian designed a rubric to evaluate success in personal management that included criteria for personal engagement with the topic, managing deadlines, asking for help, and organizing materials. Each student used the rubric for self-evaluation. Entries from journals kept by student-researchers were used to document the self-evaluations. A rubric for grading the research papers, also developed by teachers and the librarian, included criteria such as analysis, supporting evidence, organization, use of language, and referencing. Reference to both rubrics was made throughout the unit.

A fifth lesson reviewed staple information sources and demonstrations of their use. The lesson on primary sources and research methods presented basic concepts such as validity and reliability and methods of data collection for questionnaires and interviews. Students received individual help to support their particular needs. The seventh lesson was the most critical for promoting analytical thinking skills. It demonstrated methods of display for data and information (charts, graphs, models, diagrams, photos, drawings) that could be displayed in figures and tables in the paper. Emphasis was on the methods of analysis to discuss and elaborate on the data.

The next lesson explained the methods of citation for quotation and bibliography, presented in a style sheet that standardized format for schoolwide use. The ninth lesson took place when the rough drafts were due: students engaged in a peer editing session, working in pairs to share their work and offer suggestions for improvement. The last lesson took place when students' papers were returned. Teachers explained that the questionnaire was their instrument for data collection

to gather evidence to evaluate the teaching unit. Results of the survey were presented to students, and planned revisions in the unit were discussed with them for input.

An appendix to the research paper was required that contained the proposal, journal, notes, audio and videotapes, and rough drafts. Students earned 50 percent of their grade for these materials, with the emphasis on completeness.

Teachers, as action researchers, designed their study simultaneously with the teaching unit. They used the following questions as guidelines for the design:

- What are the major questions of our investigation?
- How can we refine the questions to collect data?
- How can we collect data for each question?
- How can we collaborate to analyze the data?
- What conclusions will inform revision of the unit?

The action research focused on two questions:

1. Was the grade 10 authentic research assignment successful?
2. How could we do it better?

The librarian collaborated with teachers to refine these questions and develop data collection methods that are shown in table 1. Teachers had input into the questionnaire, which consisted of twelve items that required a Likert rating and five open-ended questions (see figure 4). These items defined what is meant by a successful assignment in terms of pedagogy. Teachers kept notes on student behavior, questions, and comments. These data were used to determine student thoughts and feelings about the unit. Observations were triangulated with data from student questionnaires.

Table 1. The Teachers' Plan for Action Research

Research Questions	Data Collection Methods
How did students judge the unit? How would they change it?	a. Questionnaire administered by the librarian at the end of the unit (see figure 4). b. Observations of student behavior, comments during unit.
How did teachers judge the unit? How would they change it?	a. Content analysis of students' papers: teachers graded for content/form and librarian graded appendices. b. Observations and questionnaire results were shared in a meeting attended by English teachers of Grade 10, librarian, and principal.

Figure 4. Student Questionnaire

	Disagree				Agree
1. Timelines were reasonable.	1	2	3	4	5
2. Instructions were clear.	1	2	3	4	5
3. Library resources were adequate.	1	2	3	4	5
4. Grading system was fair.	1	2	3	4	5
5. Bibliography Charts were helpful.	1	2	3	4	5
6. Key word list was helpful.	1	2	3	4	5
7. Writing proposals was helpful	1	2	3	4	5
8. Forming a research question was helpful.	1	2	3	4	5
9. I felt well prepared to search for information.	1	2	3	4	5
10. I could get help when I needed it.	1	2	3	4	5
11. I liked using at least one primary method of data collection.	1	2	3	4	5
12. I liked using at least one method of analysis	1	2	3	4	5

What do you think?

13. What were the **best aspects** of this project?

14. What would you **change?**

15. What was the most **difficult task** you had? **Why** was it difficult?

16. How was this research assignment **different** from the way you have done research in the past?

17. What did you learn that will help you do your **Extended Essay** next year?

18. Do you think it was **worth the class time allotted? Why?**

OTHER COMMENTS

To determine teacher response to the unit, a sample of grades from student papers was used. This reflected the success of the unit in terms of student achievement as evidenced by grades. Since rubrics were used, the specific criteria for grading could be analyzed to determine strengths and weaknesses in student papers. Teachers met in a session after the unit was completed to share observations, discuss the results of the students' questionnaires, grades, the rubric, and revisions for next year.

How Did Students and Teachers Judge the Unit?

After the final drafts were submitted, 65 students, which represents 66 percent of tenth graders who participated in the assignment, completed questionnaires (see figure 4). Items 1 through 12 used a Likert rating scale of 1 to 5, with 1 indicating strong disagreement and 5 indicating strong agreement. Items 13 through 18 required extended written answers.

Table 2 summarizes the data. The first five columns display student responses. A 1 to 5 Likert scale is problematic because the 3 rating is difficult to interpret; therefore, the number of responses for each item for ratings of 1, 2, 4, and 5 were added to determine N, or the number in the sample. Scores for ratings of 1 and 2 were added to determine the number of respondents who disagreed; scores for ratings of 4 and 5 were added to determine the number of responses who agreed. The last two columns report the percentage of those who agreed and disagreed with each statement. These calculations help to identify trends in the data and are used in the analysis that follows.

Table 2. Summary of Data

	Disagree ---------- Agree							
Questionnaire Items	**1**	**2**	**3**	**4**	**5**	**NR***	**% Disagree**	**% Agree**
1. Timelines	4	11	24	21	4	1	37	63
2. Instructions	2	9	17	25	12	0	23	77
3. Library resources	5	7	17	25	11	0	25	75
4. Grading system	1	2	23	25	2	12	10	90
5. Bibliography Charts	4	8	11	21	21	0	22	78
6.Key Words	9	10	23	15	6	2	48	52
7. Proposals	5	7	23	21	9	0	29	71
8. Research question	3	1	11	30	20	0	7	93
9. Information search	2	17	12	29	4	1	37	63
10. Help	2	2	17	23	21	0	8	92
11. Data collection	3	10	27	21	4	0	34	66
12. Analysis	3	12	20	28	2	0	33	67

N=65 for ratings 1-5
N varies for each item in calculating percentage for disagree/agree since responses for ratings 1 and 2 and responses for 4 and 5 comprise N.
*NR= No response

Generalizations to the population cannot be made from data extracted from responses to items 13 through 18 because of the highly individualistic nature of students' comments. These written responses can provide insights into why students responded as they did and are used in the discussion to triangulate with the quantitative data of responses 1 through 12. Teachers' comments made during the end-of-the-unit meeting were used to triangulate with data from students to find discrepancies and points of agreement. Teachers' observations provided additional evidence for conclusions drawn from student data, and/or provided explanations for these conclusions.

At least 63 percent of student respondents agreed with every statement but one in items 1 through 12, which indicates a positive attitude towards the key components of the assignment mentioned in the questionnaire and toward the process as a whole (see table 2).

Timelines were considered reasonable by 63 percent of respondents. The open-ended question that asked students what they would change to improve the project elicited the response, "more time" from 25 percent of the respondents. In most cases the same students who were among the 63 percent who thought timelines were reasonable were among the 25 percent who wanted more time. Students made the distinction between the total amount of time given to the project from beginning to end and the time they were given to work on the project during school time, particularly with regard to time spent in the library. Advisory class, during which time students received instruction and worked in the library, was scheduled once every six days with two weeks of vacation intervening; the project began in February and ended in April. The consensus among students was that although these timelines were generous, the amount of time given during school hours was not sufficient.

Time was the most frequently mentioned suggestion for change under "other comments." Forty-two percent of the responses were related to the amount of class time used for the project. According to the teachers, many of their students said they would rather have more time in English class instead of the Advisory time. Five students specifically mentioned Advisory class in the questionnaire as a negative aspect of the project. Due to scheduling conflicts, ten students were not able to attend Advisory classes. One of them wrote, "People not taking Advisory ended up in the dust of the mob." All five English teachers thought that students' perceptions of time allotted would be improved if the project was based in English classrooms. All five teachers thought too much class time (Advisory) was used and that the assignment should be shortened and intensified. Consequently, Advisory classes were eliminated the subsequent year. Teachers were concerned about what would be eliminated from the English curriculum to make time for the research assignment. However, they admitted that students need more time for research tasks and more help with their writing.

Students also distinguished between timelines and the timing of the assignment. Many students thought the project should have started earlier in the year, mentioning IGCSE exams, a community service project, tennis, and choir as conflicting demands on their time. One student commented that another research paper had been assigned concurrently with this one.

Data about timelines was expanded by the questions, "Do you think it was worth the class time allotted? Why?" Ninety-two percent of respondents said the project was worth the class time; two-thirds of that group stated that allotting class time for the project gave them the time to ask questions and get help (see table 2). A typical comment was, "We got guidance during the lessons, which was very valuable." This was substantiated by the frequently written response, "I could get help when I needed it." Teachers, however, did not agree that class time was as well used for writing as it could have been. They concluded that class time for writing must be focused, with a product expected at the end of each period.

The issue of individual help emerged as an important criterion for a successful research assignment. One student wrote, "I was very sick for 3 weeks over the period of time we had to write the essay. However, Mr._____ helped me to get up-to-date with work and I managed to hand everything in on time." Another noted, "Mrs. _____ and Mr. _____ were always there to

help give ideas. . . .” These comment were written under Other Comments, and do not quantitatively support the conclusions that individual help was adequate. Rather, this qualitative data offers some insight into individual student experiences.

All completed papers included bibliographies. Responses to item 5 in table 2indicate a positive reaction to bibliography charts, the graphic organizers that helped students keep track of citation information for their sources. Seventy-eight percent of the students agreed or strongly agreed that the charts were useful. Inspection of the charts midway through the unit signalled that most students were not taking full advantage of library resources and helped teachers direct students to specific information sources. However, although students found bibliography charts useful, 41 percent received the lowest rating for transforming citations and notations into acceptable format (see results for category 7 in table 3). Teachers consistently commented on poor citation or referencing when a low score was given for supporting evidence (category 3). This implies that students have difficulty with citations, particularly as supporting evidence and with correct format. Teachers concluded from this evidence that allotting more time in class for the writing process, especially for revision and editing, might help to raise the scores in the categories 7 and 8, referencing and layout and mechanics of language.

Table 3. Breakdown of Grades by Assessment Criteria

Criteria for Content	**3–4 points (%)**	**0–2 points (%)**	
1. Introduction	73	27	
2. Main analysis	70	30	
3. Supporting evidence	65	35	
4. Conclusion	63	37	
Criteria for Form			
5. Organization	73	27	
6. Use of language	61	39	
	3 points (%)	**2 points (%)**	**1 point (%)**
7. Reference and layout	25	34	41
8. Mechanics of language	34	37	29

Students were positive regarding clarity of instructions and availability of library resources (items 2 and 3 in table 2), but they did not respond as positively to feeling prepared for information searching (item 9). Many students had never used the Internet for research and required help after school. In the end-of-unit meeting teachers discussed this issue, and it was noted that through focused lessons and briefings teachers as well as students need to become more familiar with databases available in the library. These observations imply that: (1)

Although students display a high level of comfort with computers, they need a lot of support in using the Internet as a research tool, and (2) Training in electronic sources is needed for veteran, as well as new teachers. These two points are reinforced by responses to key words (item 6, table 2). Only 52 percent of students agreed that key words were helpful; teachers thought vocabulary and concepts are vital prerequisites to writing commentary and that key words need more emphasis. The consensus of teachers at the end-of-unit meeting was that key words did not get enough emphasis and students did not appreciate their importance.

Reaction to the grading process was positive (item 4, table 2). However, 18 percent of respondents did not rate this item, partly because the questionnaire was administered before grades were known and some students mistakenly understood that they were to rate the actual grade they received rather than the process itself. Teachers critiqued the rubric's assessment descriptors and agreed that wording should be simplified. This was based on several teachers' observation that when the descriptors were presented in class, many students asked for clarification on words such as "register." It was agreed that the rubric's assessment criteria should be reviewed more thoroughly with students at the beginning of the unit.

Seventy-one percent of students thought writing the proposals was helpful and 93 percent agreed that formulating a research question was also helpful (items 7 and 8, table 2). One student wrote, "Personally I would have wanted to read a lot more than what I did before I thought of a research question. It would have been a lot easier than changing it five times." This is a revealing comment, illustrating that the student learned research is not a linear process, but a recursive one. Teachers observed that many students returned to the background reading stage of the project weeks after their proposals were written. Many students found that they needed to modify their research questions as they learned more about the topic. These observations validate the purpose of the proposal: to help students to achieve focus formulation. Teachers agreed that time spent on background reading was critical in helping students to focus and that some students realized too late into the unit that they should have read more.

Data collection and analysis (items 11 and 12, table 2) were not rated as favorably as formulating the research question, with about two-thirds of students rating these methods as helpful. Teachers noted that students found these items the most difficult aspects of the assignment. A common problem was the incorporation of material that was not cited or that was not directly linked to the research question or to a method of analysis. Students who received low grades on the criterion supporting evidence (item 3, table 3) received teacher comments regarding poor use of citation to substantiate analytical discussion.

What were the best aspects of the project?" Thirty-eight percent of the responses mentioned the Extended Essay or "next year," referring to the IB Extended Essay they would write the following year in eleventh grade. A typical statement was, "The preparation for the IB Extended Essay through this research paper is incredibly helpful."

When asked, "What did you learn that will help you do your Extended Essay next year," 44 percent of the responses identified specific research methods (data collection, analysis, use of the library); 26 percent stated that they had learned how to organize; 25 percent identified time management. Several comments addressed students' attitudes and feelings about the Extended Essay:

> It was just good practice so that next year it's not such a shock to us. I'll have less fear of writing 4,000 words. I'm sure it will be a lot easier next year.

A word analysis of responses to the question "How was this research assignment different from what you have done in the past?" revealed that the following words and phrases were used most often: "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!"

Comments also reflected an appreciation of 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.

An important indicator of success is student recognition of the distinction between reporting and researching and their references to "serious research" in the questionnaire. One skeptic wrote, "Don't repeat this with the (students) next year. It might psychologically damage them." The written comments were, however, overwhelmingly positive:

> As a whole, this was a good experience in learning how to do a research project and essay. I thought it was a worthy experience. I enjoyed the research very much. Nice try! After all, this was fun. Good idea! It was worth it.

Advisory classes and the "paperwork" that was required in the papers' appendices were mentioned in 39 percent of student responses as items they would like changed. Four respondents wrote that the journals were "unnecessary." There were indications in students' comments, however, that organization and time management, which the "paperwork" was designed to help, were the most important factors in feeling better prepared for the Extended Essay. This suggests the emphasis on process and support materials was helpful but that students may not see the connection. Furthermore, responses to the questionnaire items related to support materials (key words, bibliography charts, proposals and research questions) did not indicate a negative trend (see table 2). Many comments referred to the various forms or papers that were used in the unit to structure the process for students, followed by comments about fear of losing them and the time it took to assemble them in the appendix of the paper. Adverse student input about the support materials may have arisen from logistics rather than the content of the materials.

How Did Teachers Evaluate the Work of Students-As-Researchers?

The rubric, an instrument that identifies the criteria that will be assessed against standards of performance that are defined by descriptors included:

Building the Argument

- Introduction to the essay
- Main analysis
- Supporting evidence
- Conclusion

Formal Aspects of the Essay

- Organization
- Use of language
- Referencing and layout
- Mechanics of language

Each criterion was graded by matching the paper with descriptors for four levels, or standards, of performance. Points were earned relative to the standard of descriptor assigned to the paper by the teacher. For example, a paper might satisfy all the descriptors for the introduction, earning four points for that criterion, but may more closely resemble the descriptors for the lowest standard of performance for main analysis, thereby earning one point for that criterion. Points earned for the essay were totaled and converted to letter grades, from A, B, C, and D, using a chart that identified a range of points for each letter grade. An analysis of grades is followed by a content analysis of ratings given to student work within each of the criteria of the rubric in order to identify trends in weaknesses or strengths with regard to the criteria (see table 3).

Teachers observed that students' grades were higher than could be expected from the typical research assignment, although a control group was not included in the study. At least 61 percent of students received scores in the high range for each of the first six criteria in table 3. Further, twenty-six percent of the students earned grades higher than those they received on other writing assignments that year. Since a second independent sample that used the typical assignment does not exist, a normal distribution of grades—which cannot always be assumed and is admittedly a biased estimate—was used as a standard to which the results of the authentic research (AR) group was compared.

If a variable is normally distributed, 50 percent of the scores are above the mean and 50 percent are below it. In the AR group, 55 grades (62 percent) were above the mean and 34 grades (38 percent) were below the mean. Letter grades were converted to numbers to compute the mean as follows: A=4, B=3, C=2, D=1. A range that includes almost all the scores can be computed when the standard deviation (.397) is multiplied by 3 and added to the mean, setting the higher end of the range at 3.9. When the standard deviation is multiplied by 3 and subtracted from the mean, the lower end of the range is computed at 1.6. While there is not enough information to determine if this difference is statistically significant, the wide spread of scores and the small standard deviation would produce a positively skewed distribution toward grades that are above the mean.

During discussion of data in the end-of-the-unit meeting, teachers and the librarian adopted the following revisions of the assignment for the following year:

1. Provide focused class time for writing. Teachers were surprised that students felt they needed more time to write and were disappointed, overall, in the quality of the writing with regard to mechanics of language. Since the peer editing lesson was well-received by

students, teachers decided to provide more time for student practice with peer editing prior to the authentic research assignment. There was consensus that more time for the Grade 10 research paper, and shorter assignments leading up to it, were needed even though this will require dropping a literature unit from the curriculum.
2. Provide more practice in using supporting evidence, including citations, in analytical thinking and drawing conclusions.
3. Use plain and direct language to reword assessment descriptors in the rubric to promote a better understanding of assessment criteria.
4. Revise citation instructions and layout of material in the school's style sheet to make it more user-friendly. It was agreed that the style sheet would be more useful in electronic format.
5. Consolidate support materials (e.g., proposal forms, bibliography charts, style sheet) into a booklet to be distributed to:
   a. Students, to eliminate individual hand-outs and simplify organization tasks;
   b. Faculty who are teaching or advising student essays.
6. Offer teachers briefing sessions, in-services, ongoing training, or more support for:
   a. Library resources and access;
   b. Research techniques for qualitative studies.
7. Offer more opportunities for students to practice information searching and expand concepts and key words and reading focused in an area of interest to prepare for the authentic research assignment by building prior knowledge of the topic.

Implications for Teachers and Librarians

The underlying purpose of this study was to collect data that contributed to the reflective practice of classroom teachers and librarians who design and implement research assignments. Based on the positive reactions of students, it is indicated that a new dimension to the research assignment that challenges students to become authentic researchers is desirable. Was the project in authentic research successful? The researcher concludes that the consensus of students and teachers was that the assignment was a good preparation for the Extended Essay and raised awareness of what constitutes a successful assignment. Students' responses showed positive attitudes toward the support materials and recommendations for revision of the assignment point toward refinement rather than drastic revision. Structure for student efforts provided by support materials, help when needed, and sufficient time to do the work, emerged as important measures of success for students. Important measures of success for teachers included the use of key words, the use of supporting evidence and referencing in the analytical thinking and the development of an argument, and the quality of discursive writing in both content and form. The authentic research assignment raised the level of appreciation of teachers for the complexity of independent student work.

Another important implication for practitioners is the training that is essential, not only in the use of library resources, but in the use of qualitative research methods for both teachers and students. Such training offers the obvious reward of equipping educators with the tools and expertise they need to help students, but also equips them for their own action research that will inform their practice as they model the research process for students. This collaboration of students-as-researchers and teachers-as-researchers is a powerful paradigm for raising instructional quality in the research assignment.

References

Ausubel, D. P. 1963. *The psychology of meaningful verbal learning.* New York: Grune and Stratton.

Bloom, B. S., and L. J. Broder. 1950. *Problem solving processes of college students: Exploratory investigation.* Monograph no. 73. Chicago: Univ. of Chicago Pr.

Bogdan, R. C., and S. K. Bilken. 1992. *Qualitative research for education: An introduction to theory and methods.* Boston: Allyn and Bacon.

Bruner, J. 1960. *The process of education*. Cambridge: Harvard Univ. Pr.

Collins, A., and T. M. Dana. 1993. Using portfolios with middle grade students. *Middle School Journal* 25, no. 2 (Nov. 1993): 14–19.

Dana, T. M., and D. J. Tippins. 1993. Alternative assessments for middle school learners. *Middle School Journal* 25, no. 2 (Nov. 1993): 3–5.

Davis. S. J. 1994. Teaching practices that encourage or eliminate student plagiarism. *Middle School Journal* 25, no. 3 (Jan. 1994): 55–58.

Dewey, J. 1929. *Sources of a science eduation.* New York: Liveright.

Eisenberg, M., and R. E. Berkowitz. 1990. *Information problem solving: The big six skills approach to library information skills instruction.* Norwood, N.J.: Ablex.

Eisenberg, M., and M. Brown. 1992. Current research. *School Library Media Quarterly* 21, no. 3, 103–9.

Gordon, C. 1996. Is fish a vegetable? A qualitative study of a ninth grade research project. *School Library Media Quarterly* 25, no. 1: 27–33.

Hobson, D. 1996. Beginning with the self: Using autobiography and journal writing in teacher research. In *Teachers doing research: Practical possibilities,* 1. Mahway, N.J.: Lawrence Erlbaum Associates.

Irving, A. 1985. *Study and information skills across the curriulum.* Portsmouth: Heinemann.

Kelly, G. A. 1963. *A theory of personality: The psychology of personal constructs.* New York: Norton.

Kuhlthau, C. C. 1984. The library research process: Case studies and interventions with high school seniors in advanced placement English classes using Kelly's theory of constructs. Doctoral dissertation, Rutger's University, New Jersey.

———. 1986. *Facilitating information seeking through cognitive modeling of the search process.* New York: Rutgers University, School of Communication, Information and Library Studies. (ERIC Document Reproduction Service No. ED 328 268)

———. 1988. The information search process of high, middle and low achieving high school seniors. Paper presented at the meeting of the Research Forum of the American Association of School Librarians, New Orleans, LA.

———. 1989. Information search process: A summary of research and implications for school library media programs. *School Library Media Quarterly* 18, no. 1: 19–25.

———. 1997. Learning in digital libraries: An information search process approach. *Library Trends* 45, no. 4: 575–806.

Kulleseid, E. R. 1986. Extending the research base: Schema theory, cognitive styles, and types of intellligence. *School Library Media Quarterly* 15, no. 1: 41–47.

Piaget, J. 1928. *Judgment and reasoning in the child.* New York: Harcourt Pr.

Powell, J. C. 1993. What does it mean to have authentic assessment? *Middle School Journal* 25, no. 2 (Nov. 1993): 36–42.

Richelle, M. N. 1995. *B. F. Skinner: A reappraisal.* East Sussex, U.K.: Psychology Pr.

Sizer, T. 1992. *Horace's school: Redesigning the American high school.* Boston: Houghton Mifflin.

Stripling, B. R., and J. M. Pitts. 1988. *Brainstorms and blueprints: Teaching library research as a thinking process.* Littleton, Colo.: Libraries Unlimited.

Wiggins, G. 1992. Creating tests worth taking. *Educational Leadership* 48: 26–33.

Appendix: Related Links

1. The research-paper assignment has always been an easy target for folks looking to make a buck or two by selling already-written papers. The Internet has made it easier to find these services *and* to find databases of free research papers. One of these databases is School Sucks (www.schoolsucks.com). Of course, there are sophisticated services such as A-1 Termpapers (www.a1-termpaper.com/custom.shtml) that offer custom research—even doctoral dissertations—if you're willing to pay the price.
2. The National Science Education Standards (www.nap.edu/readingroom/books/nses/html) provide one useful perspective on what constitutes authentic student research. Browse the sections on "Science as Inquiry."
3. The North Central Regional Education Laboratory (NCREL) has a brief introduction to action research (www.ncrel.org/sdrs/areas/issues/envrnmnt/drugfree/sa3act.htm) that includes a list of recommended readings. A useful collection of resources on action research can be found at www.scu.edu.au/schools/sawd/arr/arr-home.html.

School Library Media Research (ISSN: *1523-4320*) *is the successor to School Library Media Quarterly Online and the predecessor to School Library Research, an official journal of the American Association of School Librarians. The purpose of School Library Media Research is to promote and publish high quality original research concerning the management, implementation, and evaluation of school library programs. The journal also emphasizes research on instructional theory, teaching methods, and critical issues relevant to the school library profession. Visit the* ***website*** *for more information.*

The mission of the American Association of School Librarians is to advocate excellence, facilitate change, and develop leaders in the school library field. Visit the ***AASL website*** *for more information.*