Information Search Process

A Summary of Research and Implications for School Library Media Program

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Information Search Process: A Summary of Research and Implications for School Library Media Programs

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This paper summarizes a series of five studies on students' perspective of information seeking in response to a research assignment. Feelings, thoughts, and actions commonly experienced in the information search process are described in six stages. Implications for further research are discussed, as well as findings that have direct impact on school library media programs.

The challenge for education in the twenty-first century is to prepare students to use information in the workplace, in their personal lives, and as responsible citizens. The report of the ALA Presidential Committee on Information Literacy recommends restructuring the learning process to involve students more actively. "Such a restructuring of the learning process will not only enhance the critical thinking skills of students, but will also empower them for lifelong learning and the effective performance of professional and civic responsibilities."[1]

Education is changing from the assembly-line environment of the Industrial Age offered by textbook teaching to the data-rich environment of the information age offered by resource-based learning. In response to this change, the media center becomes the information center of the school, providing access to a wide range of resources and guidance in the process of learning from them. The concept of the media center as an extension of the classroom providing resources for learning is certainly not a new one, and current trends in education are completely compatible with this concept. It is an idea whose time has come. As a result, a new perspective on library instruction is emerging that incorporates the more traditional skills of locating and using information sources with the process of learning from information.

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The information research process is a holistic learning process encompassing the affective experience of students as well as their intellect. Students' experience within the process must be clearly understood in order for teachers and media specialists to design library assignments and plan instruction that encourage rather than impede learning.

The research summarized in this paper concentrates on the information search process from the student's point of view and investigates the user's perception of information seeking. For the purposes of this research, the working definition of the "information search process" is that it is a complex learning process involving thoughts, actions, and feelings that takes place over an extended period of time, that involves developing a topic from information in a variety of sources, and that culminates in a presentation of the individual's new perspective of the topic.

This paper describes a series of studies in which a model of the information search process was developed. First, the theoretical basis of the model is presented. Next, a summary of each study is given including the research questions addressed, the methods used to examine the problem, and the findings leading to further hypotheses. Finally, implications for future research and practice are discussed.

THEORETICAL BASIS

The theoretical foundation for this work draws from psychology, using schema theory and Personal Construct Theory as well as from information science.[2,3] An information search

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is viewed as a process of construction in which people build their view of the world by assimilating and accommodating new information. Personal Construct Theory describes a series of feelings that are associated with the phases of construction. When a person initially confronts new information, he or she commonly experiences doubt and confusion. These feelings escalate as the person encounters increasingly confusing, sometimes contradictory messages. The experience can become quite threatening, causing the person to consider turning back and abandoning the new idea. At this point, Kelly purports that the person forms a hypothesis that moves the process toward testing and assessing the new information in order to form new constructs.

The question of phases or stages in information seeking has been addressed by Taylor, who describes four levels of information need: the visceral level, a vague sense of something missing; the conscious level, a clear need for information but inability to express precisely what is sought; the formal level, an ability to state what information is needed; and the compromised level, where the expression of information need is accommodated to the sources available.[4]

The research of Belkin and his colleagues describes an information search as moving from an anomalous state of knowledge (ASK) to a coherent or defined state.[5] Dervin describes an information search as a sense-making process.[6] Mellon's research reveals the prevalence of anxiety in students, particularly at the beginning of the process.[7]

SUMMARY OF FIVE STUDIES

These theories and my daily experience with students as a library media specialist led to the hypothesis which initiated this research, that from the student's perspective the process of seeking information involves the complex process of construction. The following is a summary of five studies on the information search process in which a model in six stages was developed, refined, and verified.

The first study addressed the problem of high school students' experience in the search process and the question of whether that experience resembled the process of construction as Kelly described it.[8] Twenty-four seniors in advanced placement English classes were tracked during two research paper assignments over a period of one school year. Instruments were designed to elicit perceptions and strategies that are usually unobservable. Data were collected from students' journals, search logs, short pieces of writing, observations, interviews, timelines, flowcharts, and questionnaires. Content analysis was used with categories derived from the theory base, particularly from Personal Construct Theory.

The information search process was found to be similar to Kelly's description of the process of construction. A six-stage model of the information search process was developed describing thoughts, actions, and feelings commonly experienced by students in each stage as shown in Figure 1. The first stage, task initiation, is characterized by feelings of uncertainty of what is expected and apprehension at the task ahead. Students think of possible topics in preparation for selecting one to pursue. In the second stage, topic selection, a feeling of optimism is commonly experienced after a topic has been chosen. The third stage, prefocus exploration, is a difficult time for most students, when they experience confusion and frustration and may even doubt their ability to complete the task. Confusion and doubt are present until a focus begins to emerge.

The fourth stage, focus formulation, is the turning point of a search, when students have learned about their topic from the information they encounter and have formed a personal perspective or focus within the topic. In the fifth stage, information collection, which occurs after they have a focused point of view of the topic, they gather information with more confidence and a sense of direction. Interest and motivation were found to increase at this stage. In the sixth stage, search closure, feelings of relief are common, but feelings of anxiety about presentation also begin to be noted. After presentation students often experience satisfaction and accomplishment if all has gone well and disappointment if it has not.[9] This model became the hypothesis for further studies.

The second study addressed the problem of how these students' perceptions of the information search process had changed after four years of college and how they compared with the model.[10] The same questionnaire eliciting perceptions, which had been administered to this group in high school, was used to provide longitudinal data on their perceptions, with 20 of the original 24 responding. Responses after college were compared with the responses they gave in high school, and statistical significance was determined through t Tests. Findings showed that students' perceptions matched the model more closely after college, particularly those regarding focus and process within time. The college students' perceptions of focus formulation had changed significantly in the direction indicated by the model from those they had in high school. Students came to expect a topic to change and a central theme to evolve during a search for information. They

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 or dissatisfaction
Thoughts		ambiguity →			→ specificity		
Actions	seeking relevant information →			increased interest →		→ seeking pertinent information	

Figure 1. Kuhlthau Model of the Search Process

Students came to expect a topic to change and a central theme to evolve during a search for information.

also expected to become more interested as the search progressed.

The third study further addressed the problem of students' perceptions of the information search process after four years of undergraduate study and involved a test of the Kuhlthau model over a period of time. In this study, however, an internal view of students' experience in the process was sought. Case studies of four of the college students were developed and compared with case studies of the same students when they were in high school.[11] The methods used for these longitudinal case studies were content analysis of interviews conducted with each participant and timelines of the search process drawn by the four participants.

The case studies revealed a sense of ownership in the process and in an area of expertise emerging after college. Findings also verified the Kuhlthau model generally, but students'

These students described the information search process as a purposeful, sense-making process in which they were actively seeking a thread . . . an answer to questions.

descriptions revealed a more recursive rather than strictly linear process, with focus commonly evolving during exploration, formulation, and collection, stages 3 through 5, as the process moved toward closure. These students described the information search process as a purposeful, sense-making process in which they were actively seeking a thread, a story, an answer to questions, or focusing and narrowing.

These two studies showed that the model held over time for this select group of students. Further quantitative study was needed to make the model of the information search process generalizable to other types of library users. Study of a larger, more diverse population of high school students was planned, as well as study of users in other types of libraries, such as academic and public.

The fourth study, funded by the Rutgers Research Council, examined the information search process of high-, middle-, and low-achieving high school seniors. The purpose was to verify the Kuhlthau model and to address three questions. Do other high achievers experience a process similar to those in the initial sample? Do low- and middle-level students experience a similar process? Does the search process relate to teachers' assessment of the product?[12,13]

The study took place in six high schools with 147 seniors in English classes selected as participants. Students were identified as high, medium, and low achievers by their scores according to national percentiles on standardized tests. A research paper assignment of four weeks' duration was made. Process surveys were administered at three points in the information search process—initiation, midpoint, and closure—eliciting thoughts and feelings at each point. The teachers assessed the students' papers for presence of focus and quantity of sources as well as grade. Statistical analysis was made by using t Tests and ANOVA to determine significance, and Pearson product-moment measures to determine degree of correlation and measures of linear regression. The data from the forty participants identified as low achievers were incomplete and could not be analyzed in the study. There was no significant difference, however, between the high and middle achievers, with the exception of grade; the high achievers received higher grades.

Findings showed a significant change in thoughts during the information search process moving from general background, to specific and more narrowed, to clearer and more focused. There was a similar significant difference in the confidence and feelings during the process, with confidence increasing throughout and feelings moving from confused to confident and relieved. In addition, there was a slight correlation between change in confidence with teachers' assessment of focus in the papers. Change in student confidence also showed some correlation with the grade the teachers gave to the paper. While this study indicates that the model of the search process can be generalized to other students, it also indicates a number of areas for further research that will be discussed in another section of this paper.

The fifth study in this series addressed the problem of validating the model of the information search process in a wider sample of library users. Up to this point, the research had been confined to high school students and a small sample of college students and had not addressed the question of whether there were similar patterns in the process of users in other types of libraries. In a study funded by a Library Research and Demonstration Grant from the U.S. Department of Education, 385 library users from 21 school, academic, and public libraries were studied.[14,15] The instrument employed was a process survey similar to that used in the prior study, revised to include statements taken directly from the original model, which was administered to each participant at initiation, midpoint, and closure, shown in Appendix A. Analysis was made first by descriptive statistics and next by inferential statistics, including measures of significant difference and analysis of variance in Paired t Tests, Chi Square, ANOVA, and Scheffe tests.

Findings revealed a similar process across types of libraries, with background information being sought at initiation, relevant information at midpoint and closure, and with

The public library users were more confident at initiation than the academic and school participants.

some participants seeking focused information at closure. Descriptions of thoughts were general and vague at initiation, narrowed and clearer at midpoint, with only 50 percent making focused statements at closure. Confidence increased significantly from initiation to closure. The adjectives most used to describe feelings were confused, frustrated, and doubtful at initiation and satisfied, sure, and relieved at closure. However, the public library users were more confident at initiation than the academic and school participants, and while the academic and school library users indicated similar low confidence at initiation, the college students were significantly more confident at closure than the high school students.

An important finding in this study was that while participants' thoughts and feelings matched the model as anticipated, their identification of task did not. According to the model, initiation tasks would be to recognize information need and to identify general topic; midpoint tasks would be to investigate information on the general topic and to formulate a specific focus; closure tasks would be to gather information pertaining to the specific focus and to complete the information search. Participants, however, reported their task as "to gather" at initiation, "to gather" and "to complete" at midpoint, and "to complete" at closure.

In summary, this series of studies reveals the information search process to be a complex learning process that can be described as occurring in a sequence of stages. Affective symptoms of uncertainty, confusion, and frustration are associated with the vague, unclear thoughts about a topic or question in the early stages of the process. As thoughts shift to clearer, more focused constructs, a parallel shift is noted in increased confidence and feelings described as sure, satisfied, and relieved. Search tasks, however, do not seem to match the state of thoughts and feelings in the early stages of the information search process, and there is evidence of a lack of tolerance for these early formative stages. In addition, although people's thoughts move from vague, general descriptions of topics to clearer, more narrowed ones, many do not make focused statements about their topic at any point in the search process.

IMPLICATIONS FOR RESEARCH

Research in the school library field, as in other areas of librarianship, has been lacking in two important aspects. First, studies rarely build on prior research findings. With a few notable exceptions, such as Mancall and Loertscher, research has been fragmented and piecemeal, without connection to prior work or sufficient concentration on one area to build a useful understanding of an issue that can inform practice.[16,17] Second, for the most part school library media research has not been theory-based. Studies have rarely taken into account psychological, educational, or information theory which informs the questions being addressed. The research into the information search process, on the other hand, builds in a sequence of five studies and is theory-based.

For the most part school library media research has not been theory-based.

This research offers two important implications related to the methodology applied to research on school library media problems. The first is that the combination of qualitative and quantitative methods can be productively applied to study many aspects of a problem over an extended period of time. The research process is related to the information search process in that problems evolve through different stages of formulation. Problems in early formative states may be best addressed by qualitative methods to form testable hypotheses, which can then be measured by more quantitative methods. Qualitative methods also offer an internal view, which addreses the why of an issue, bringing insight to more quantitative findings. The complex research problems confronting the library media field need to be addressed over a period of time in a series of studies in order to verify and generalize findings that contribute to practice in school library media centers.

The second methodological implication of this research is that it provides an example of the application of relevant theory from other related fields to offer a new way of looking at a problem. Theory from cognitive psychology, information science, and education is particularly fertile ground for school library media research. The research issues addressed in the school library field are not isolated from other fields. Creative connections can lead to new insight and understanding.

The model developed in this research provides a new way of viewing school library media practice, and many questions for further research are generated in this work. The following is a discussion of three such questions.

The informal feedback from librarians and teachers using the process approach with low achievers has been encouraging, and there appears to be promise for helping at-risk students. However, the data collected from this sample were incomplete and not included in the analysis, so that the findings can not be generalized to this population. Further research, using a combination of qualitative and quantitative methods that are tailored for this group, is warranted. If this research is to impact programs for at-risk students, further study is needed.

The effect of students' experience in the information search process on the outcome or product of their search is an important accountability issue. The fourth study in this series indicated that the way students go through the process affects their written presentation. Further research is needed on this critical issue. Findings indicate that thoughts and feelings change in the information search process as an individual forms new constructs. These new constructs should be evident in the papers that students write at the close of the search. The information search process is the preparation phase of the writing process. Writing blocks, which often result from incomplete thoughts, may be a consequence of a lack of construction during information searching.[18] This important hypothesis needs further investigation because, although writing from sources makes up 80 percent of school writing, most writing research has concentrated on writing from what is already known rather than writing from what is learned from information.[19,20]

The issue of implementing a process-centered library media program needs study, particularly as it relates to student learning. Several field studies investigating the process approach are in progress. Evaluating what works, what problems are encountered, impact on student learning, teachers' methods, and librarians' role are some of the questions that need to be studied in order for library media programs to be built on rigorous research findings.

IMPLICATIONS FOR PRACTICE

The process approach to information use provides a new perspective on a K–12 library media program that may be envisioned in the following description. Students come to understand their own search process through guided use of information from elementary school through high school. They learn that thinking, reflecting, and mulling are an important part of learning from information; that uncertainty is not only okay, it is the beginning of all learning. They take the initiative to find out and the responsibility for telling others. These are basic skills for the information age.

A K–12 process approach begins in elementary school with

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daily opportunities to find out and tell others arising from questions and problems in every area of the curriculum. Rather than assignments requiring a few long reports with detailed citations, children's natural curiosity is put into play each day in response to: "What do I want to know? What did I find out? Where did I find it?"

In middle school and junior high school, the process approach continues with longer concentrated periods of extended research under the guidance of the teacher and library media specialist on topics that truly engage the students' interest and curiosity. The two key elements at this point are sufficient time to work through the entire process and caring guidance to develop strategies for success in each stage.

In secondary school, the process approach is absorbed into assignments across the curriculum with students pursuing meaning from information to share through presentations in many forms, such as short recaps, debates, papers, essays, videos, plays, portfolios, experiments, proposals, and computer programs. Individual interpretation and personal perspective are stressed, as well as the facts on which they were built, and the citations identifying sources of information used are required.

Research on the information search process originated in practice and sought to build a theory grounded in actual situations in school library media centers. When the findings of this research are presented to library media specialists, their common reaction is an intuitive recognition, an agreement with the results, and an interest in ways to implement programs based on the findings.

Preliminary results from studies of the implementation phase reveal several problems, however. One problem is that traditional library assignments do not encourage the process approach and sometimes actually impede the process of learning from information, particularly in the early stages. Teachers are sometimes confused about the purpose of library assignments and about what they are actually asking students to do.

Traditional library assignments do not encourage the process approach and sometimes actually impede the process of learning from information.

Another problem that is surfacing in the implementation studies is lack of time. Rarely is there enough time for students to work through the process under the guidance of librarians and teachers. In most cases, students are expected to accomplish the major part of the assignment independently, even in elementary and middle school. A second problem regarding time is the lack of planning time for team teaching between librarians and teachers.

Other problems are also being reported involving the teaming of librarians with teachers. Questions of respective responsibilities are arising, resulting from librarians' becoming involved in areas formerly considered the teachers' domain. Librarians are also reporting that they are "being left alone" to complete instruction and guidance. Who is responsible for what needs to be worked out.

Implementation programs are confronting old paradigms, such as "covering the material in the curriculum guide" and "teaching for the test," which obstruct progress in restructuring schools around active, individual learning. Most schools are not structured to accommodate a process approach to individualized learning.

For the most part, however, the library media specialists involved in implementation are encouraged, realizing that change takes time and that they are part of a larger restructuring movement. One reported that, "Topics created by students amazed the teachers and myself." Some common positive reactions that media specialists report are that they have changed the way they approach students, particularly in guiding and encouraging them to "focus in." "The stages from confusion to feeling good about a focus actually happened!" They also report a new interest in the end product and are becoming involved in reviewing students' papers or other presentations. "The teacher invited me to class when students shared their research with each other." The following are some quotations from the media specialists involved in implementation projects reflecting positive outcomes: "Children were able to discuss their fears and felt comfortable going through this!" "Students liked extra attention and library time." "This group seemed to have fewer difficulties and frustrations." "At the end I found them helping each other." "They were the only class that worked well as a group."

This research helps media specialists and teachers understand students' experience in the information search process. It provides insight for designing library assignments and interventions that actively involve students in using information for learning.

The process approach empowers librarians in new ways and encourages them to address the larger issues of educating for information use and lifelong learning. It offers them a tool for teaming with teachers which, combined with expertise in resources, makes them extremely valuable partners. The time is ripe for restructuring education, and the process approach offers media specialists a way to make a major contribution to the movement.

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APPENDIX A. PROCESS SURVEY

Midpoint

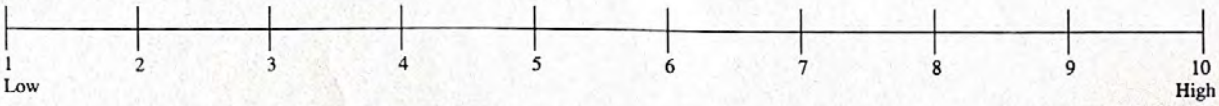
1. What are you looking for?

2. Describe the topic in a short paragraph.

3. What is the title of your project?

4. Who have you talked to about your project?

5. On the scale below indicate your confidence level at this point in the project.



6. From the adjectives below, check those that describe how you feel at this point in the project.

- ☐ confident
- ☐ disappointed
- ☐ frustrated
- ☐ relieved
- ☐ sure
- ☐ other _____
- ☐ confused
- ☐ doubtful
- ☐ optimistic
- ☐ satisfied
- ☐ uncertain

What is your task now? Please check one box.

- ☐ To gather information that pertains to the specific topic.
- ☐ To investigate information on the general topic.
- ☐ To complete the information search.
- ☐ To recognize an information need.
- ☐ To formulate a specific topic.
- ☐ To identify the general topic.
- ☐ Other _____

What are you doing now? Check as many boxes as apply to you.

- ☐ Discussing the topic.
- ☐ Making a comprehensive search of the library.
- ☐ Browsing in the library.
- ☐ Outlining to organize information.
- ☐ Reading over notes for themes.
- ☐ Making a preliminary search of the library.
- ☐ Conferring with people who know about the topic.
- ☐ Asking librarian questions.
- ☐ Talking about themes and ideas.
- ☐ Making a summary search of the library.
- ☐ Skimming and scanning sources of information.
- ☐ Writing about themes and ideas.
- ☐ Reading about topic.
- ☐ Taking detailed notes on facts and ideas.
- ☐ Taking brief notes of facts and ideas.
- ☐ Rechecking sources for information initially overlooked.
- ☐ Recording bibliographic citations.
- ☐ Other _____

What are you thinking now? Check as many boxes as apply to you.

- ☐ Organizing ideas and information.
- ☐ Identifying possible alternative topics.
- ☐ Becoming informed about the general topic.
- ☐ Exhausting all possible sources of information.
- ☐ Considering alternative topics in light of the information available to me.
- ☐ Choosing the broad topic that has the potential for success.
- ☐ Comprehending the task before me.
- ☐ Recognizing ways to draw project to close.
- ☐ Considering alternative topics in light of the time I have to complete the project.
- ☐ Choosing specific concentrations within the general topic.
- ☐ Considering alternative topics in light of the requirements of the project.
- ☐ Confronting the inconsistency and incompatibility in the information encountered.
- ☐ Getting more interested and involved in ideas.
- ☐ Defining and extending my specific topic.
- ☐ Gaining a sense of direction and clarity.
- ☐ Recalling a previous project when I searched for information.
- ☐ Predicting success of each possible concentration.
- ☐ Identifying several possible areas of concentration in the broad topic.
- ☐ Considering alternative topics in light of the things that are of personal interest to me.
- ☐ Seeking information about my specific area of concentration.
- ☐ Other _____

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