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A Content Analysis of Information Process Models

Aileen C. Meyer
University of Northern Iowa

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A Content Analysis of Information Process Models

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Aileen C. Meyer
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Date Approved

Barbara Safford
Graduate Faculty Reader

9-17-99
Date Approved

Charles R. May
Graduate Faculty Reader

9/15/99
Date Approved

Rick Traw
Head Department of
Curriculum and Instruction

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This study used content analysis of seven information process models which were published between the years of 1988 and 1997 to determine if these models share certain characteristics among themselves, and with recent educational theories. Findings indicate that the seven information process models do contain characteristics from the learning theories of metacognition, constructivism, and process education.

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Chapter 1

Introduction

A number of information process models have been introduced in recent years into the instructional practices of school library media programs. Certain educational theories including metacognition, constructivism, and process education have influenced instructional change in other curricular areas. To understand better the current status of information process models, it is important to look at these educational theories in order to determine their effect on instructional change in school librarianship.

Background

Our current education system dates back to the Industrial Revolution. At that time, our country needed to prepare its agricultural workers for factory jobs, so we built a school system that catered to the mass production mentality (Funderstanding, 1998). In this model, the teacher was the lecturer while the student memorized facts to present to the teacher at a later date. This model continued to characterized educational practice for half a century.

Reformers became interested in learning and its relationship to cognition and skill development. "In the mid-1950s, a new science began to take shape-cognitive science. Within four decades it has transformed our view of human minds and has provided a new foundation for education" (Farnham-Diggory, 1992, p. xi). Cognitive psychologists believed that to make education effective for our students the focus must be on knowledge and how one attains knowledge. "Effective education must be based on knowledge of how human minds work, learn and grow" (p. xi). Benjamin Bloom was a forerunner in this type of cognitive thinking. His taxonomy of learning levels had a

tremendous influence on the future of the development of instructional objectives and student learning. Jean Piaget,s studies in cognitive development also influenced educators' thinking in changing curriculum based on cognitive constructivism. Stemming from cognitive reasoning, educators believed that curriculums needed to be restructured with connections to what a student already knows along with other areas of learning. "In the view of most cognitive psychologists, learning is a product of the interaction among, what learners already know, the information they encounter, and what they do as they learn" (Bruning et al, 1999, p. 6).

Educators began to put more emphasis and importance on metacognition and how it influences learning. Metacognition has been defined in many ways. A simple definition is, "Knowledge concerning one's own cognitive processes and products or anything related to them" (Matacognition, 1991). Metacognition has also been referred to as thinking about one's thinking. Educators began to look at student's problem solving skills in connection with their meta-cognitive abilities. The ability to solve problems by taking facts and using them appropriately became the focal point. Each individual develops his/her own techniques and individual style of learning and problem solving. Although individuals will naturally acquire some metacognitive knowledge of their own problem solving capabilities, helping students develop that knowledge is the key to a quality learning environment. "Metacogntion knowledge can help students compensate for low domain knowledge and a limited strategy repertoire. Metacognition appears to improve with instruction" (Bruning, Schraw, & Ronning, 1999, p.104). Based on this knowledge, educators felt the need to develop curriculums and strategies that take into account students' solving problem capabilities. They believed that learning environments needed

to be constructed to maximize students' opportunities to develop their own problem solving strategies.

Small (1990) stated:

> ...acquisition of knowledge and problem-solving skills is maximized when a novice is guided by a more knowledgeable individual who initially models problem solution but yields responsibility for problem solution as the novice acquires knowledge and skills. (p. 414)

These significant changes in the way teachers teach and students learn became known as constructivism. Constructivism is based on students' learning and how they understand. Constructivists believe that students need to construct their own meaning from authentic experiences. "In the constructivist view, learners arrive at meaning by selecting information and constructing what they know" (Bruning et al, 1999, p. 215). Accepting the proposition that we learn by constructing new understandings of relationships and phenomena in our world makes accepting the present structure of schooling difficult. "Educators must invite students to experience the world's richness, empower them to ask their own questions and seek their own answers, and challenge them to understand the world's complexities" (Brooks & Brooks, 1993 p. 5). It was thought that these individual problem-solving strategies developed by the learner became especially critical in the area of research because students were now exposed to a larger variety of resources than in the past. Students not only needed to decipher through more information but they also needed to have the capability of using it effectively. In order to prepare individuals to survive in the twenty-first century, instruction must provide experiences and activities that enable students to handle information appropriately and become independent learners.

Bruning et al, state:

> Ideally, classrooms provide authentic contexts for developing expertise by providing learning that students find meaningful, builds on prior knowledge, and allows self-expression. The ideal outcome is for students not only to acquire knowledge but also to become independent, self-regulated learners. (1999, p. 234).

They also stated:

> Individuals characterized by a performance orientation are less persistent, are less apt to use learning strategies, and attribute their failure to ability and teachers. Individuals characterized by a learning orientation however are more persistent, are more likely to use strategies, and attribute their success to strategy use and effort., (p.179).

In conjunction with emphasis on performance came an emphasis on understanding based on previous experiences. "Knowledge is created and recreated on the basis of previous learning, not simply acquired. What motivates learning is the search for meaning" (Brooks & Brooks, 1993, p. 7).

Based on the emphasis on learning, education now focuses on the process of problem solving rather than on the end product. Educators feel that focusing on process rather than just content improves learning. Recognizing that students were now exposed to insurmountable amounts of information, educators realized that simply teaching students facts was no longer practical. It became important for students not to only access information but to use and evaluate it as well. "Neither students or adults can hope to learn all the information they need to survive. What is necessary is that they know how to find, access, interpret and use information" (Plans for Progress, 1992, p. 3). Students of today live in a world that has been radically changed by the vast amount of

information available through a variety of resources. In addition to the change in resources, the way we seek and gain information has also changed. Electronic resources have not only provided massive amount of information to our students, but have also provided new avenues of research that were not available two decades ago. Due to the information explosion and the amount of information available, the need for students to be active information users has dramatically increased. Teaching techniques and curriculum objectives that once were considered appropriate were no longer acceptable. Communities of learning of the past needed to be changed to accommodate the massive amount of information of our changing society. The focus changed from that of preparing students to function in the manufacturing age to preparing them for the Age of Information. "Today's student are tomorrow's citizens and workers. To become self-supporting, self-governing, self-educating, and contributing members of society, they must be able to locate, access, analyze, organize, assimilate and communicate information" (1992, p. 3).This new concept dramatically changed the role of the teacher from lecturer to that of facilitator.

The American Library Association (1999) stated the following:

> To be prepared for a future characterized by change, students must learn to think rationally and creatively, solve problems, manage and retrieve information and communicate effectively. By mastering information problem solving skills students will be ready for an information-based society and technological workplace. Research on the restructuring of school calls for the teacher's role to change from a textbook lecturer to that of a coach. Students become active learners who create their own knowledge after interacting with information from a variety of resources. (p. 1).

In order to enable our students to interpret and use information properly, we need to structure our library instruction skills on what we know about learning. Therefore students need to develop higher order thinking skills necessary for them to solve information problems. In reaction to this realization about research, the focus to information problem solving began to shift from the expected outcome of the problem to the process of solving the problem itself. "Learning should take place in a collaborative group setting which should be as natural as possible. Learners would be allowed ample time to form new knowledge. Problem solving is an important aspect to creating good meta-cognitive skills" (1999, p. 1). Simply knowing a resource tools exists represents a relatively low-level of cognition. Students needed to have higher order thinking skills to solve information problems. Being able to use a tool and incorporate knowledge by problem solving represents a higher level of thinking and cognition. (Eisenberg & Berkowitz, 1995, p. 11). By providing personal insights into the learner's thinking processes, flexible and confident problem-solving skills are built. It is important to an individual's thinking to ask the right questions, reflecting on what is known and what one wants to know. Being aware of one's learning also allows one to learn independently.

This type of learner awareness is critical in successful research skills. When one gains the ability to solve information problems in an effective way, he/she is considered to be information literate. Information literacy is the term media educators use to express one's ability to solve information problems successfully. "Information literacy refers to the ability to access, evaluate, and use information from a variety of sources" (Doyle as cited in From Library Skills, 1997, p. 2). To be information literate qualifies one not only to locate information as previously taught in our library programs, but also to sort it and use it as well. Not only will this need for information literacy continue throughout a

child's years in school, but employers will expect a employee to have the ability to use and process information effectively as well.

The school's library media program and curriculum also functioned under the same developmental patterns as education in general. The emphasis in the library was to memorize kinds of resources and how to find them. "The predominant themes of library skills instruction from the 1960s to 1990s concentrated on the finding and location of information plus the orientation to the library as a place" (Loertscher & Wools, 1998, p. 6). The ability to use the resources effectively was not always addressed. Library skills were often taught in isolation and separate from the rest of the curriculum with the focus being on the sources. In other words, the skills were content driven rather than process orientated.

Kuhlthau (1988) stated the view below:

> Traditionally library instruction has been oriented to teaching the sources in the library and not to the process of information seeking. However there is much more going on in the information search process than the location and use of sources. Traditional instruction does not take into account the dynamic learning process in which students are involved in an information search. (p. 4)

"Students were introduced to various library sources and access points, but rarely did they understand how to obtain an understanding of their topic through traditional library skills" (Kuhlthau, 1985, p. 35). Educators found that in order for students to be successful researchers, they needed to focus on the process of searching in addition to content. Stripling stated that, "Any learning experience involves several different strands, one of which is usually content and rest of which are process, such as information seeking and use or decision making" (1995, p. 164).

She further stated:

> The process of rethinking a library program based on research about learning seems daunting. First, we must identify from the research what we know about learning. Then we must derive the implications from those findings for learning, planning and teaching through the library. (p.163)

Therefore, systemic problem solving formulas were developed in order to provide students with meaningful authentic experiences. These models assisted students to apply the learning to knowledge by giving opportunities to solve problems individually and logically. These models are also referred to as Information Process Models.

This research will investigate contemporary learning theories, and how they relate to the development of the Information Process Models.

The following models will be considered.

1. Stripling and Pitts "Research Process Model" (1988).
2. Kuhlthau "Model of the Search Process" (1989).
3. Eisenberg and Berkowitz "The Big Six Skills" (1990).
4. Ann Irving, "Information Skills Across the Curriculum" (1992).
5. "California School Library Association Information Literacy Model" (1994).
6. Pappas and Tepe "Pathways to Knowledge Information Skills Model" (1995).
7. Yucht "Flip It" (1997).

Problem Statement

Practice in contemporary school librarianship emphasizes the teaching of the research process rather than the transmission of content. Several information process models were developed between 1988 and 1997 as guides for information skills learning. These

models share certain characteristics among themselves and with recent educational theories.

Research Questions

1. Can an analysis of information process models show that they developed from metacognition theory.
2. Can an analysis of information process models show that they developed from constructivism?
3. Can an analysis of information process models show that they developed from process learning?

Purpose of Study

This study will investigate the commonalties among the information process models and the theories of metacognition, constructivism, and process learning.

Assumptions

This research will be able to isolate terminology from the information process models in such a way as to make possible an analysis based on the checklist derived from the research in the literature review.

Limitations

This analysis is based on several published information process models. This research will not look at the implementation of the models, but rather at the content and

organization of the various models. The researcher's interpretation of the characteristics of the models may not be that of the authors.

Significance of Study

Library media specialist need to be aware of the origination of information process models based upon studies of cognitive educators and current learning theories. Understanding the relationship to learning theories will help the library media specialist in constructing appropriate learning and teaching techniques. Identifying commonalties between the information process models would strengthen the legitimacy of library practice with both librarians and other educators.

Definitions

Constructivism: Point of view that holds that what individuals learn and understand is constructed through their mental processes and social interactions. (Bruning et al., 1999, p. 412).

Cognition /Cognitive abilities: Intelligent process and product of the human mind including reasoning and problem solving. (Flavell, 1977).

Developmental: A progression from a simpler or lower to a more advanced. The (American Heritage College Dictionary, 1993, p. 380).

Information process model: A systematic plan to use in teaching the process approach to library and information skills. (Eisenberg, & Brown, 1992).

Knowledge: Familiarity, awareness or understanding gained through experience or study. (The American Heritage College Dictionary, 1993, p. 752).

Learning: The act or experience of gaining knowledge. (The American Heritage College Dictionary, 1993, p. 772).

Metacognition: Knowledge about cognition: knowledge used to regulate thinking and learning. (Bruning, et al., 1999, p. 416).

Process Education: Concerned with the facilitation and development of transferable skills that relate to all areas of life: focusing on relating to others, analyzing and synthesizing of information and experience of planning and implementing action. (Cole, 1972, p. 4).

Chapter 2

Literature Review

One of the major issues facing library media specialists today is how best to prepare students to be successful in gathering and using information. In response to this need, a number of information process models were developed. The theories of metacogntion, or understanding how one learns, constructivism, and process education, preceded the origination of these information process models.

Metacognition

In the 1970s, educators began to look at the importance of metacognition and its relationship to learning. A number of the studies focused on memorization and how individuals understood their own capabilities and limitations in this area.

In one study conducted by Flavell, Friedricks, & Hoyt (1970), 14 preschoolers, 28 kindergartners, 28 second graders, and 14 fourth graders were tested to determine if memorization was a developmental process. The focus of the study was to determine strategies that children use to memorize material and what knowledge they have concerning their own memories. Each student was asked to recall a number of items. All the students were given an opportunity to use a variety of strategies to help them memorize the items for recall. In the study the older students were more realistic about their memorization processes and skills as they predicted how many items they were able to recall. The younger students primarily used the strategy of naming to help them remember the items, where as the older students used higher level thinking skills of anticipation and rehearsal to successfully remember items (pp.324-340).

In conclusion, the researchers stated:

> No extant conceptualization be it based on stimulus-response associations or an information-processing paradigm, makes provisions for the fact that the human memory system cannot only produce a learned response to an appropriate stimulus or retrieve a stored image, but it can also rather accurately estimate the likelihood of its success in doing it. (p. 339)

The significance of this study is that it indicates that individuals have knowledge concerning their abilities to understand how they can learn (memorize) and that this knowledge is developmental.

In 1977, Markman monitored comprehension in children to determine whether or not comprehension is developmental and part of a process a child must engage in to gain knowledge. He also attempted to determine if children are aware of their own comprehension failures and thus are able to evaluate understanding of their learning. The subjects of his study were twelve students in first, second, and third grade. There were an even number of males and females in all grade levels. They were asked to give advice on clarity of instructions on two tasks placed before them. In both tasks, the researcher provided the children with partial directions making sure crucial information was missing. In the first problem, they were asked to explain the directions they were given to complete a task. Secondly, they were asked to perform a magic trick based upon obscure directions. The activities were videotaped and data was gathered and scored. The results indicated that there were no differences in gender or scoring criteria within a grade level. However, there were significant differences in comprehension among the grade levels. The results clearly indicated that older children realized the information was incomplete

before the younger children. First graders had to be encouraged to ask pertinent questions and repeat instructions before they realized the directions were inadequate (1977a, p. 986-990). The two activities signify the developmental nature of comprehension.

Markman stated:

> These qualitative differences lend support to the hypotheses that young children are processing the material at a relatively superficial level. The findings suggest that young children in this study are failing to execute the instructions mentally, and consequently they do not notice the problems. (p. 989)

Markman conducted a similar study involving children in grades first through third with twenty children in each group. Children were asked to demonstrate a magic trick and a game task. All children were given directions, however some children had the tasks demonstrated for them as well. Once again the directions were inadequate and the students were asked to judge the directions for understanding. When enacting the tasks, the younger children did not ask for clarification and were unable to discern that the directions were incomplete. The students who had the task demonstrated along with directions were more successful. The first graders did not understand that their comprehension was faulty and thus were processing material at a very superficial level. The researcher concluded that children are much more likely to notice problems in instructions when they are forced to process them thoroughly as in watching the demonstration and enacting out the tasks (Markman, 1977b pp. 990-992). In other words young children do not notice problems with their comprehension naturally and are unaware of their failure to understand.

Brown and Smiley also published a study on metacognition in 1977. The purpose of their study was to examine children's knowledge of their cognitive process in relation to their own awareness of problem solving. Their subjects consisted of twenty students in each of the following age groups: 8, 10, 12, and 18. Each subject listened to two unfamiliar fairy tales and then was asked to recall and rate the important elements in the story. The results of their study showed that third through fifth-grade subjects were unable to differentiate items in terms of their relative importance to the text. The older students however, had less difficulty in deciphering the main ideas from the less important ones. The researchers concluded that there was a strong developmental trend demonstrating more understanding of detail and main ideas as children got older. They stated:

> The ability to rate units of a complex passage in terms of importance to the theme is a late developing skill that has important implications for training study habits and reading comprehension skills, and even for the design of text materials. Children who have difficulty determining the key points of a passage can hardly be expected to select them for intensive study. (p. 7)

In conclusion, the authors suggest the lack of ability to find main ideas will produce problems for children that will contribute to poor study habits. Once again the significance of this study indicates that comprehension is metacognitve as well as developmental. It also demonstrates concern that if students were not able to isolate main events or details in the story they would not be able to evaluate other materials for important and relevant information.

In 1980, Brown, Campione, & Day published another study questioning how we devise instructional routines to help students improve their learning. They monitored two groups of mildly retarded children, ages 9 and 11, to see if they could recall a list of pictures. The list was too long for them to remember without engaging in some specific memory strategies. The first time the children were asked to recall the list without any instruction and the second time they were taught strategies to help them facilitate the learning process. It is important to note that included with the instruction of the strategies was a self-testing component instructing children to monitor their own states of learning. The results showed that older students benefited from being taught strategies and that the effect of the direct instruction was observed in their abilities to recall and understand additional information. Therefore, the instruction promoted understanding and knowledge in other areas. The younger children did not benefit from the strategies thus enabling the researcher to believe that this skill is developmental. The researchers did acknowledge that background experience influence an individual's learning and should be taken into consideration when planning instruction. In an attempt to make the student more successful, the researchers stated that, "As instructors our task should be to help student to develop the understanding of the learning situation" (p. 17). They went on to conclude, "The essential aim of training is to make the trainee more aware of the active nature of learning and the importance of employing problem-solving, trouble-shooting routines to enhance understanding" (p. 20). Once again, it appears that understanding ones' own learning or metacognition is developmental and that children need to be active participants in their own learning. They need to be taught strategies and techniques to enhance and understand their own learning.

In 1981, Flavell, Spear & Green conducted a study concerning children's metacommunicative understanding and comprehension monitoring abilities. These researchers wanted to test for a variety of developmental differences between the age groups. In the study, 32 kindergartners and 32 second graders were asked to play an audiotape giving them directions to make a building with blocks. There were 23 block-building instructions with 7 being clear and easy to follow. The other 16 directions were incomplete, ambiguous, and confusing. The researchers videotaped the students as they attempted to respond to the directions. It was concluded that older children were more likely to show verbal and nonverbal signs that detect inadequacies or poor instructions. Older children had a tendency to show concern about communication problems and monitor their own comprehension better than younger ones. In conjunction with their observations, younger children displayed trouble attending to, analyzing, and evaluating the various communications. They were unable to identify inadequacies in communication and never focused on objects of cognition during the experiment. In conclusion, the researchers observed that younger children need further differentiation and elaboration when dealing with comprehension and communication problems. "It appears that children may often not understand what they see, hear, or read and yet be totally oblivious to this state of affairs" (p. 53). In speaking of their study, they concluded, that research such as theirs, "...could contribute to formal or informal educational efforts by identifying as precisely as possible what children need to learn in this area, and therefore, what one should consider trying to teach them" (p. 53). They go on to say it is important for teachers and parents to help children acquire skills in the area of communication and comprehension.

Once again, the research demonstrates that cognitive skills are developmental and students need opportunities to develop them. Schools are responsible to provide children with authentic experiences where they are given an opportunity to acquire needed cognitive skills.

Constructivism

Stemming from studies involving Piaget and Vygotsky's observations of children and learning and research in metacognition came another theory referred to as constructivism. Constructivism focuses on how children learn and gain knowledge. Students' cognitive developmental abilities are a major factor in learning and thus a major issue in constructivism. Constructivism is considered the process of constructing understanding based on experiences and cognitive abilities allowing a student to gain knowledge. (Brooks & Brooks, 1993). To understand constructivism, educators must focus attention on the learner. "Deep understanding occurs when the presence of new information prompts the emergence or enhancement of cognitive structures that enable us to rethink our prior ideas" (p. 15). Although experimental research base for constructivist theories seems to be lacking, content area researchers have applied the theory in their own disciplines.

In one study in language arts, two researchers attempted to discover whether children's skills as inquirers and writers are enhanced by involving them in authentic experiences that are collaborative in nature. Fourth graders were asked to participate in a variety of activities including writing and researching information on a unit on animals. The researchers observed the students as they worked on an animal unit in a collaborative setting of active and literate learners. After evaluating conversations, writings, and

interactions between students and teachers, the researchers discovered that by allowing students to participate in authentic experiences, they became more open to new ways of thinking and feeling. The results of the data confirmed that by placing the children in an active learning environment, the children were inspired to use higher order thinking skills and that they learned from each other. In other words, they constructed understanding based on collaborative questioning and discussions. This understanding was reflected in their writing also. In conclusion, knowledge and understanding were obtained because of the authentic collaborative nature of the study. Due to the success of the animal unit, the researchers stated, "Our conclusion, therefore, is that to achieve most effectively the educational goal of knowledge construction, schools and classrooms need to become communities of literate thinkers engaged in collaborative inquiries" (Wells, & Chang-Wells, 1992, p.100). Collaborative authentic learning is an important element in the consturctivist theory. Wells and Chang-Wells study also demonstrates the importance of schools allowing students to have control over their own thinking and learning.

In another study, faculty members at The University of Iowa developed a program called Science PALS (Parents Activities and Literature in Science) in hopes of moving teachers towards a more interactive constructivist model of teaching science. The purpose of the study was to examine students' attitudes toward science, which was based on exposure to an interactive constructivist teaching that included parent involvement and other strategies focusing on literature. Two groups were chosen, consisting of children in grades one through six. One group was taught by teachers who received professional development in Science PALS and the other group was taught by teachers who did not. Science PAL instructors received instruction in teaching and learning strategies based on

a constructivist philosophy. Both teachers were given kits containing hands on science activities. The results of the research concerning attitudes toward science were determined by a survey. Based on the survey, the researchers concluded that the children taught by the Science PALS approach had significantly better attitudes toward science. The survey also demonstrated that students in grades 3-6 were much more influenced by the Science PAL approach, where as children in grades 1-2 were not. This indicated a developmental characteristic to a learner's ability to respond to a constructivist environment. This experiment seems to indicate that although teachers were given the same resources to instruct their students, students are more receptive to an interactive constructivist approach versus the traditional approach to teaching (Dunkhase et al, 1997, pp.1-6).

In attempts to understand the relationship between instruction and group dynamics, another study focused on children's reactions to an interactive math activity. The purpose of this study was not to test teaching methods, but rather to test student learning in interactive authentic situations. Elementary children were instructed to toss dice and keep score of the results by using an abacus. The nature of the activity involved adding and subtracting from one's score based on the toss of the dice. In the process of playing this game, children were introduced to the concept of subtraction. Students' interactions were recorded and evaluated. It was concluded that the students developed their own strategies including comparison, cancellation, and compensation to keep score. The majority of the students also established an understanding of adding and subtracting integers because of the game. The researchers concluded that by involving students in authentic situations,

they began to develop strategies linking familiar mathematical processes to new situations based on intuition and previous experience.

Williams & Linchevskil (1981) stated:

> We see activity theory as giving us a perspective for the design of instructional activity, in particular ones in which it is intended to "fill" the cognitive gaps in children's extension of the number concepts through appeals to intuitions arising outside mathematics. We design social activity in which children engage with situations and tools, language, and symbols which allow successive transformations from process to object (p. 20).

This study concerning integers and an abacus is significant in that it shows students develop learning by involvement in authentic activities designed to engage children in discussion where they are encouraged to develop strategies to solve problems.

Process Education

Out of the theories of metacognition and constructivism came a new approach to teaching called process education. To understand process education, one needs only to look at Piaget's logical operations and apply them to learning environments where developments of skills are transferable and interrelated.

A leading educator in process education, Cole attempted to develop a definition and rationale for process education for The Eastern Regional Institute of Education, which planned to implement process education in its elementary school. Based on a variety of interpretations and studies on process education, Cole outlined a theoretical and conceptual base by designing a paradigm for process education. His paradigm is based upon his view of process education.

Cole (1972) observed the following:

> Process education recognizes that the first and foremost objective of curriculum and instruction should be those skills which the learner needs if he is to acquire, organize, generate, and utilize in a satisfying and productive manner the wealth of information and knowledge available to him. These include perceptual, motor, affective, cognitive, and social interactive skills. (p. 24.)

To summarize his paradigm he stated that , "It has been pointed out that education directed toward the purposeful and deliberate facilitation of skills is process education" (p.55).

In conclusion, Cole wrote:

> If educational practice becomes more concerned with promoting the skills basic to learning and building knowledge (making meaning), children can be expected to demand, seek, and create more and more information and knowledge as they continue to engage in the thrill and adventure of meaning making. (p. 37)

Providing students with a process education environment gives them an opportunity to construct meaning from collective experiences. It also recognizes that gaining knowledge is not static but rather an on-going process and gives individuals the opportunity to gain knowledge from skills obtained from those experiences.

In an earlier study conducted in 1960, Bruner reviewed and evaluated research which was originated by thirty one scientists at a conference held in Massachusetts on metacognition. Based on his analysis of the research, Bruner concluded that students will learn most readily when one focuses on the role of structure in learning, readiness for

learning, intuitive and analytical thinking, and the desire to learn and how it may be stimulated. In discussing the importance of structure, he also discussed the significance of focusing on understanding and discovery for each individual in all learning situations.

Bruner states:

> Mastery of the fundamental ideas of a field involves not only the grasping of general principles, but also the development of an attitude toward learning and inquiry, toward guessing and hunches, toward the possibility of solving problems on ones own. (p 20)

Providing students with a learning environment where the focus is in on solving problems individually and transferring acquired skills into all areas of knowledge is considered process education.

Information Literacy

Information literacy is a term used in the school libraries to describe the ability to find and use information. (Information Power, 1998, p.1).

Carol Kuhlthau (1984) conducted research to investigate process orientated instruction. She wanted to learn more about the process high school seniors went through to learn sources and research methods in the library. She used several data instruments including questionnaires, interviews, journals, timelines, and flow charts. Kuhlthau observed that she, "...found that students not only needed, but wanted guidance in the process which they were working through as they were using the library" (p.35). In her research, she identifies six stages describing the process students usually go through while working through research. The six stages she identified are initiation, selection, exploration, formulation, collection, and presentation (p. 36).

In conclusion she wrote:

> Students need help in recognizing the various stages typical to the research process. They also need guidance in learning useful strategies to apply at the various stages in the process. Once they understand the process and know some useful strategies, they are better equipped to transfer their library skills to other research situations in other libraries. (p. 36)

Kuhlthau recognized that students, in order to become successful researchers, need to understand and experience the process approach of actively working through a research problem. This active process approach involves engaging the student in controlling and participating in their own learning.

Kuhlthau concluded:

> The process approach to teaching library research seeks to actively engage the intellect of users. Students need to be guided through the levels of thinking while they are researching a topic in the library. Understanding the research process enables students to more intelligently use library sources and to transfer their ability to other situations of information needs in other libraries. (p. 40)

Eisenberg and Brown (1992) reviewed four themes associated with teaching library skills to determine their status and accuracy. They did so by evaluating a number of related studies thus making an attempt to draw conclusions based on the evidence. In discussing theme two, the nature and scope of library and information skills, they compared four process models and found them more alike than different. They stated, "It appears that the various process models are more alike than different, and it may be possible and desirable to begin speaking about a common process approach to library and information

skill instruction" (p. 105). This similarity helps one to conclude that the models are based on similar objectives since the categories and basic processes are so similar. Although they believe that the instruction of library skills have a positive impact and should be part of the library media program, they admit additional research is needed to determine the true effectiveness of the models. "Most major research questions related to library and information skills instruction, therefore, still remain" (p. 107).

Conclusion

In conclusion, based on the nature of the information process models, it appears that authors were influenced by theories concerning metacognition, and constructivism. The research on metacognition and children indicate that awareness of process is developmental and affects such skills as communication of information and problem solving. The research also indicates that students need ample opportunities to develop skills related to gathering and using information. Instructional techniques need to take into consideration learner focusing on their development of knowledge.

One of the researchers reviewed in the study, Flavell (1998) called for schools to actively engage the learner and give ample opportunity to develop one's knowledge and cognitive abilities. He concluded, that there are a variety of school experiences that may assist the growth of learning and that schools need to provide experiences that allow children to develop their metacognitve skills.

He stated:

> "Good school should be hotbeds of metacognitive development, for the banal sounding reasons that so much self-conscious learning goes on in them. In school, children have repeated opportunities to monitor and regulate their cognition as

> they gradually pass from novice status to semi-expert status in microdomain after microdomain. They have innumerable metacognitive experiences and innumerable opportunities to acquire person, task and strategy metacognitive knowledge. (p. 27)

In conclusion, research in this area identifies a group of developmental cognitive abilities and skills that students need to enhance learning. The most important ones seem to include: provisions for developmental growth, monitoring self progress, development of individual problem solving strategies, active learning, collaboration, authentic activities based on previous experiences, individual in nature, responsibility for one's own learning, cooperative learning, emphasis on process rather than product, the ability to transfer skills across all disciplines through a process approach to learning, and focusing on understanding rather than isolated concepts.

Chapter 3

Methodology

This content analysis analyzed seven process models in order to determine if they developed from the learning theories of metacognition, constructivism, process education, and information literacy. Because content analysis is a tool that is objective and systematic, it offers a sound approach to research (Carney, 1972). Krippendorff (1972) defined a content analysis as "A research technique for making replicable and valid inference from data to their content" (p. 21). A content analysis was chosen as the preferred methodology for this research study because the inferences are compiled from the data and are analytical in nature. A content analysis was used to determine whether six information process models originated and evolved from learning theories by determining if the models contain characteristics associated with the learning theories.

This researcher evaluated a variety of research studies to determine the characteristics common to the learning theories of metacognition, constructivism, process learning, and information literacy. The elements considered essential by the researcher were identified and derived from the learning theories and are listed on a checklist found in Appendix A.

Comparing the process models to the checklist identified whether the particular model contained the presence or lack of presence of these elements associated with the four learning theories.

This researcher considered the following process models:

1. Stripling and Pitts "Research Process Model" (1988)
2. Kuhlthau "Model of the Search Process" (1989)

3. Eisenberg and Berkowitz "The Big Six Skills" (1990)
4. Ann Irving, "Information Skills Across the Curriculum" (1992).
5. "California School Library Association Information Literacy Model" (1994)
6. Pappas and Tepe "Pathways to Knowledge Information Skills Model" 1995
7. Yucht, "Flip It" (1997)

The models are displayed in Appendix B.

The researcher analyzed the models themselves and core writings (books and articles) about the models. The skills, activities, and applications identified by the authors of each model were compared to the checklist. If this researcher determined that the characteristic evaluated was included in the process model, a check mark was entered. When all the models were evaluated, the number of check marks for each category was noted. The results were analyzed and conclusions were drawn.

This researcher determined that the information process models needed to contain 50% or higher in the checklist in each of the learning theories in order to consider the information process model as related to that particular learning theory. A checkmark was made for each category only if the characteristic was easily identifiable. It is acknowledged that the authors of the information process models being evaluated may argue that categories not checked are included in their model. For the purpose of this research paper however, unless that category being considered was obvious in the model, this researcher chose not to assume that is was present.

Chapter 4

Analysis

Data gathered about the seven information process models were analyzed to determine whether or not the learning process models are related to the learning theories of metacognition, constructivism, and process education.

The results are recorded in Tables 1, 2, and 3.

Research question one asked if the information process models developed from metacognition.

Table 1 shows the characteristics of the models this researcher identified that relate to the elements of metacognition from the analysis checklist.

Table 1: Metacognition Elements

	Metacognition	Problem Solving	Developmental	Memory	Total
Stripling/Pitts (1988)	X	X	X		75%
Kuhlthau (1989)		X			25%
Eisenberg/ Berkowitz (1990)	X	X	X		75%
Irving (1992)		X			25%
California (1992)	X	X			50%
Papas/Tepe (1995)	X	X			50%
Yucht (1997)		X	X	X	75%

The data shows that five of the information process models include 50% of the elements that reflect a development related to metacognition. Only the Kulthau and Irving information process

models failed to include 50% or more of the necessary elements to show this relationship.

Research question 2 asked if the information process models developed from constructivism. Table 2 shows the characteristics of the model this researcher identified that relate to the elements of constructivism from the analysis checklist.

Table 2: Constructivism Elements

	Background Experience	Collaboration	Authentic Activities	Individual	Total
Stripling/Pitts (1988)		X	X	X	75%
Kuhlthau (1989)	X	X		X	75%
Eisenberg/ Berkowitz (1990)		X		X	50%
Irving (1992)		X		X	50%
California (1992)	X	X	X		75%
Papas/Tepe (1995)	X	X	X	X	100%
Yucht (1997)	X	X	X	X	100%

The data shows that all of the models scored 50% or more in the category of constructivism demonstrating that all of the models contain elements related to constructivism.

Research questions 3 asked if the information process models developed from process education. Table 3 shows the characteristics of the models this researcher identified that related to the elements of process education from the analysis checklist.

Table 3: Process Education Elements

	Responsibility	Process	Cooperation	Knowledge	Understanding	Total
Stripling/Pitts (1988)	X	X	X	X	X	100%
Kuhlthau (1989)	X	X	X	X		80%
Eisenberg/ Berkowitz (1990)	X	X	X	X	X	100%
Irving (1992)		X	X	X	X	80%
California (1992)	X	X	X	X	X	100%
Papas/Tepe (1995)	X	X	X	X	X	100%
Yucht (1997)	X	X	X	X		80%

The data shows that all of the information process models included 50% or more of the elements that reflect a relationship to process education.

It is important to note that not all elements were present in any of the models. All of the information process models used in this study demonstrated some developmental relationships from contemporary educational learning theories.

Chapter 5

Summary, Conclusions, and Recommendations

Summary

All the models scored above the 75th percentile in process education suggesting that the primary focus of the information process models is on process rather than content.

The seven information process models also scored 50% and above in the constructivism section demonstrating that the models correspond with the current emphasis on constructivism. The scores were lower in the area of metacognition, which may be due to the categories on developmental growth and problem solving strategies for improving memory, comprehension, and problems in communication since it was very difficult to determine if these two concepts were present in the information process models.

Conclusions

This content analysis of learning theories and information process models investigated whether or not the information process models are related to contemporary learning theories of metacognition, constructivism, and process education. Based on the checklist developed by this researcher, it was determined that the information process models did develop from concepts relating to the three learning theories.

Although two of the process models scored less than 50% in the area of metacognition, the other five models demonstrate an awareness of the importance of one's metacognition and problem solving abilities in relation to engaging in research. The results of the checklist showed, however, that the models were especially characteristic of the elements of constructivism and process education. In the area of

constructivism, it was determined that the authors designed their models based on the constructivist philosophy rather than the more traditional philosophy. This means that the activities in the information process models are student produced with the teacher being the facilitator while the students construct ideas to form knowledge. This researcher also concluded that the authors focused on the process or procedures of research rather than on content, as has been the practice in the past. The authors' strong emphasis on process is also indicative of their belief that it is importance for students to understand the process of research in order to use information effectively.

It is also important to note that although the information process models were developed to be used in conjunction with research skills taught in library media programs, the nature of the information process models makes them a valuable tool to engage in any problem solving activity throughout the curriculum. Determining that the models originate from current reputable educational theories shows that the information process models are an essential tool in instructing students to develop information literacy. It also gives credibility to their inclusion into the curriculum.

Recommendations for Further Study

Further study of the information process models is needed in order to determine the effectiveness of the models in relation to traditional research procedures.

There is also a need for further research in the area of constructivism. Much of the discussions concerning constructivism were based on opinion and experience and not actual research. The only available research concerning constructivism is found in specific content areas. To determine the actual effectiveness of the constructivist

approach to learning, future studies need to involve skills that are integrated throughout the curriculum.

Other questions for study might be how to integrate the information process models throughout the curriculum or how the information process model can be used to solve information problems in content areas. In addition, it would also be beneficial to determine who is using what process models and if those using the models find them effective.

These questions may need to be studied to determine if the information process models are reputable, effective, and practical tools to be used throughout the curriculum by not only media specialists, but by all educators providing authentic experiences for their students.

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Appendix A

Check List Concerning History of Process Model

Metacogntion:

_____Provides for strategies to monitor self progress

_____Includes problem solving activities to allow students to develop own strategies to enhance learning.

_____Allows for developmental growth

_____Includes problem solving strategies for improving memory, comprehension, and problems in communication.

Constructivism

_____Background experience is considered an integral part of learning (Allows students to draw on experience enabling them to link experience to new knowledge)

_____Allows for collaborating

_____Activities are authentic

_____Is individual in nature

Process Education

_____Allows for responsibility for ones own learning

_____Emphasis on process rather than product

_____Allows for cooperative learning

_____Promotes discovery and creating of one's own knowledge

_____Focuses on understanding and meaning rather than isolated concepts

Appendix B

TAXONOMY OF THOUGHTFUL RESEARCH

Fact-finding
Asking / Searching
Examining / Organizing
Evaluating / Deliberating
Integrating / Concluding
Conceptualizing

Key Characteristics of Research Taxonomy Levels

Level	*Characteristic*
1. Fact-finding	Finding simple facts
2. Asking / Searching	Finding answers to questions
3. Examining / Organizing	Reorganizing information
4. Evaluating / Deliberating	Evaluating information and conclusions
5. Integrating / Concluding	Drawing conclusions
6. Conceptualizing	Creating original solutions

Stripliing, Barbara K., & Pitts, Judy M. (1988). Brainstorms and blueprints: teaching library research as thinking process. Englewood, CO: Libraries Unlimited.

Appendix B

STAGES OF THE LIBRARY RESEARCH PROCESS:

Section 1
Initiating a Research Assignment

TASK	To prepare for the decision of selecting a topic.
THOUGHTS	Contemplate assignment • Comprehend task • Relate prior experience and learning • Consider possible topics.
FEELINGS	Apprehension of work ahead • Uncertainty.
ACTIONS	Talk with others • Browse library collection • Write questions about prospective topics.
STRATEGIES	Brainstorm • Discuss • Contemplate possible topics • Tolerate uncertainty.

Section 2
Selecting a Topic

TASK	To decide on a topic for research.
THOUGHTS	Weigh topics against criteria of personal interest, assignment requirements, information available, and time allotted • Predict outcome of possible choices • Choose topic with potential for success.
FEELINGS	Confusion • Sometimes anxiety • Brief elation after selection • Anticipation of prospective task.
ACTIONS	Consult with others • Make preliminary search of library collection • Use encyclopedias for overview.
STRATEGIES	Discuss possible topics • Predict outcome of choices • Use general sources for overview of possible topics.

Section 3
Exploring Information

TASK	To investigate information with the intent of finding a focus.
THOUGHTS	Inability to express precise information needed • Become informed about general topic • Seek focus in information on general topic • Identify several possible focuses.
FEELINGS	Confusion • Uncertainty • Doubt • Sometimes threat.
ACTIONS	Locate relevant information • Read to become informed • List interesting facts and ideas • Make bibliographic citations.
STRATEGIES	Tolerate inconsistency and incompatibility of information encountered • Intentionally seek possible focuses • List descriptors • Read to learn about topic.

Section 4
Forming a Focus

TASK	To formulate a focus from the information encountered.
THOUGHTS	Predict outcome of possible focuses • Use criteria of personal interest, requirements of assignment, availability of materials, and time allotted • Identify ideas in information from which to form a focus • Sometimes characterized by a sudden moment of insight.
FEELINGS	Optimism • Confidence in ability to complete task.
ACTIONS	Read lists for themes.
STRATEGIES	Make a survey of lists • List possible focuses • Choose a particular focus and discard others or combine several themes to form one focus.

Section 5
Collecting Information

TASK	To gather information that defines, extends, and supports the focus.
THOUGHTS	Seek information to support focus • Define and extend focus • Gather pertinent information • Organize information in notes.
FEELINGS	Realization of extensive work to be done • Confidence in ability to complete task • Increased interest.
ACTIONS	Use library to collect pertinent information • Request specific sources from librarian • Take detailed notes with bibliographic citations.
STRATEGIES	Use descriptors to search out pertinent information • Make comprehensive search of various types of materials, i.e., reference, periodicals, nonfiction, biography • Use indexes • Request assistance of librarian.

Section 6
Preparing to Present

TASK	To conclude search for information.
THOUGHTS	Identify need for any additional information • Consider time limit • Notice decreasing relevance • Notice increasing redundancy • Exhaust resources.
FEELINGS	Sense of relief • Sometimes satisfaction • Sometimes disappointment.
ACTIONS	Recheck sources for information initially overlooked • Confirm information and bibliographic citations • Organize notes • Make outline • Write rough draft • Write final copy with footnotes and bibliography.
STRATEGIES	Return to library to make summary search.

Kuhlthau, Carol C., (1994). Teaching the library research process. (2nd. Ed.). Metuchen, NJ: Scarecrow Press.

Appendix B

THE BIG SIX SKILLS DEVELOPED

Figure 3.1: Definitions of the Big Six Skills

1. Task Definition:
   - 1.1 Define the problem.
   - 1.2 Identify the information requirements of the problem.

2. Information Seeking Strategies:
   - 2.1 Determine the range of possible sources.
   - 2.2 Evaluate the different possible sources to determine priorities.

3. Location and Access:
   - 3.1 Locate sources (intellectually and physically).
   - 3.2 Find information within sources.

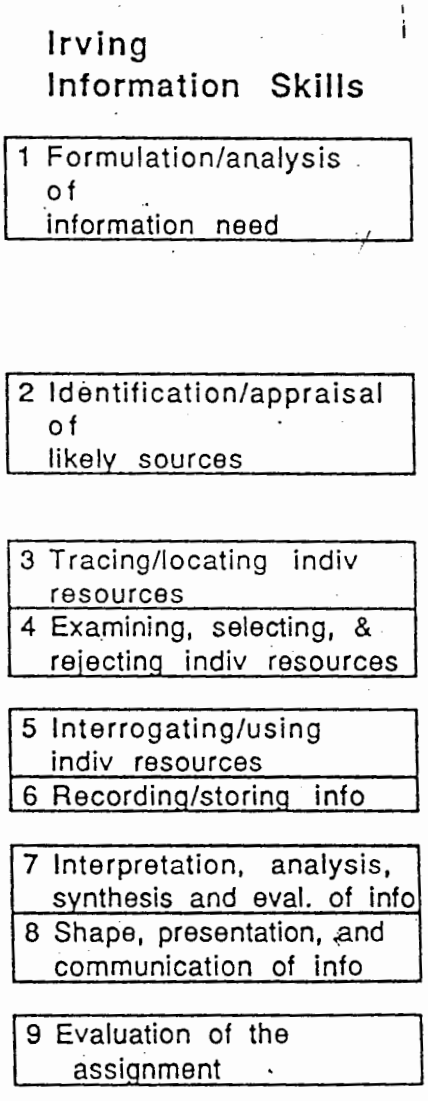
4. Use of Information:
   - 4.1 Engage (e.g., read, hear, view) the information in a source.
   - 4.2 Extract information from a source.

5. Synthesis:
   - 5.1 Organize information from multiple sources.
   - 5.2 Present information.

6. Evaluation:
   - 6.1 Judge the product (effectiveness).
   - 6.2 Judge the information problem-solving process (efficiency).

Eisenberg, Michael B., & Berkowitz, Robert E., (1995). Information problem-solving: the big six skills approach to library & information skills instruction. Norwood, NJ: Ablex Publishing Corporation.

Appendix B



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Appendix B

An Information Literacy Model

Although the definition of information literacy may appear to be simple, the concept is complex. Recent research regarding the nature of information literacy has resulted in the development of several search process models. The model that emerges on the following pages is a synthesis of existing models. It is reproduced here as the basis for the discussion of integrating information literacy into all areas of the curriculum for all students in all languages.

The model can be viewed from three different perspectives as shown in Figure 1:

- The searcher's thinking,
- The search process, and
- The instructional strategies.

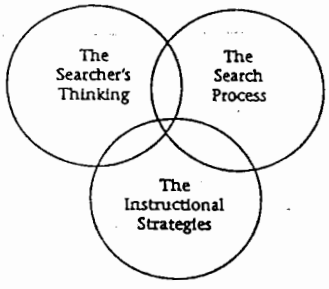


Figure 1: An Information Literacy Model - Three Interdependent Processes

The Searcher's Thinking

The first component of the information literacy model considers what a person might be thinking when confronting an information problem. A searcher's thinking pattern might look something like the following diagram:

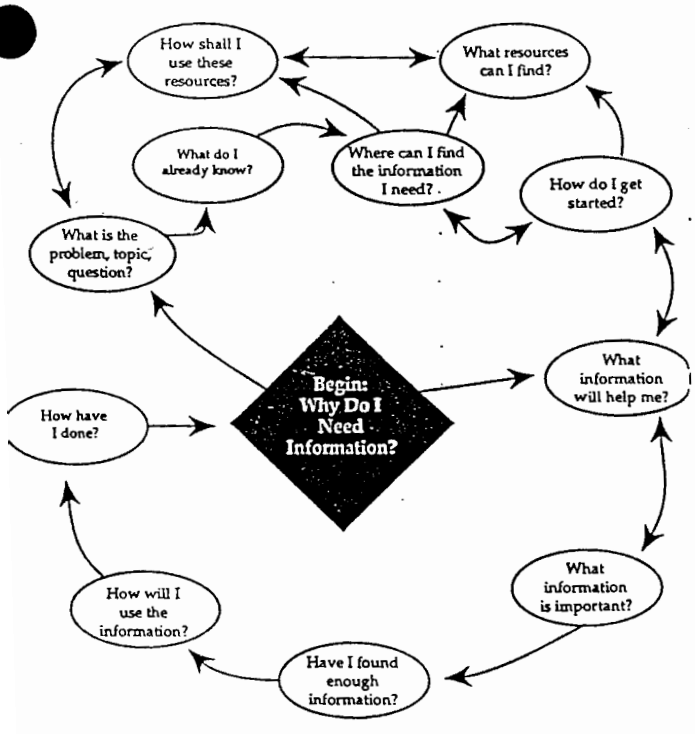


Figure 2: The Searcher's Thinking

The second component of the information literacy model describes the search process. It suggests a systematic way of approaching an information problem. While specific stages can be identified, the search process will look different for each person and for each problem. The process might look something like the following diagram:

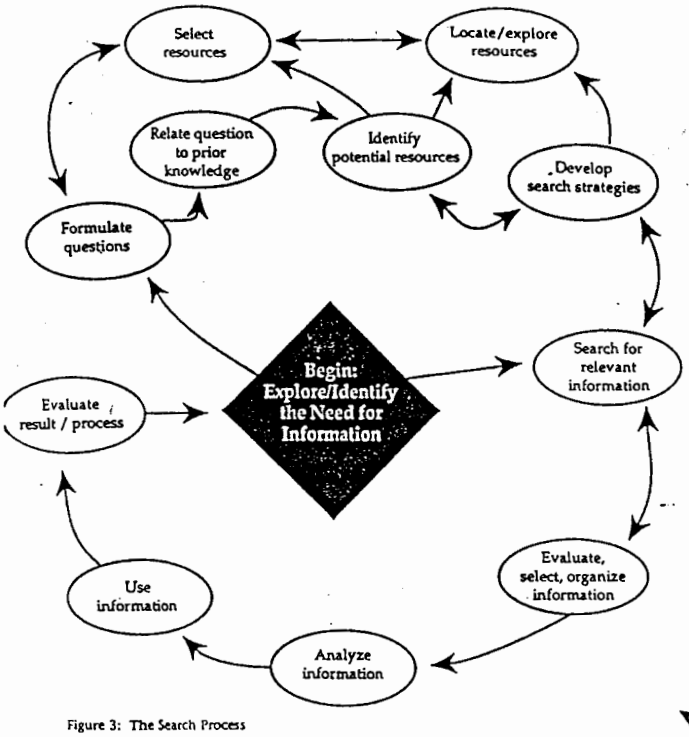
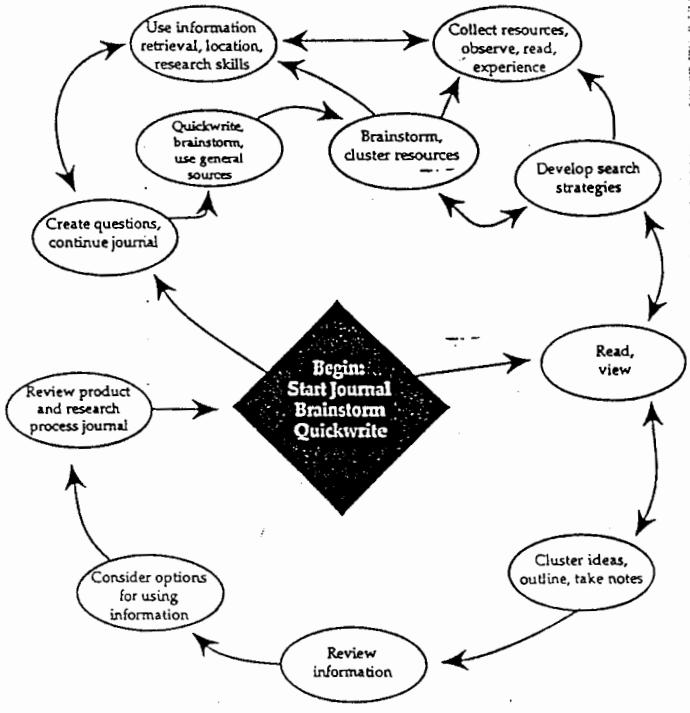


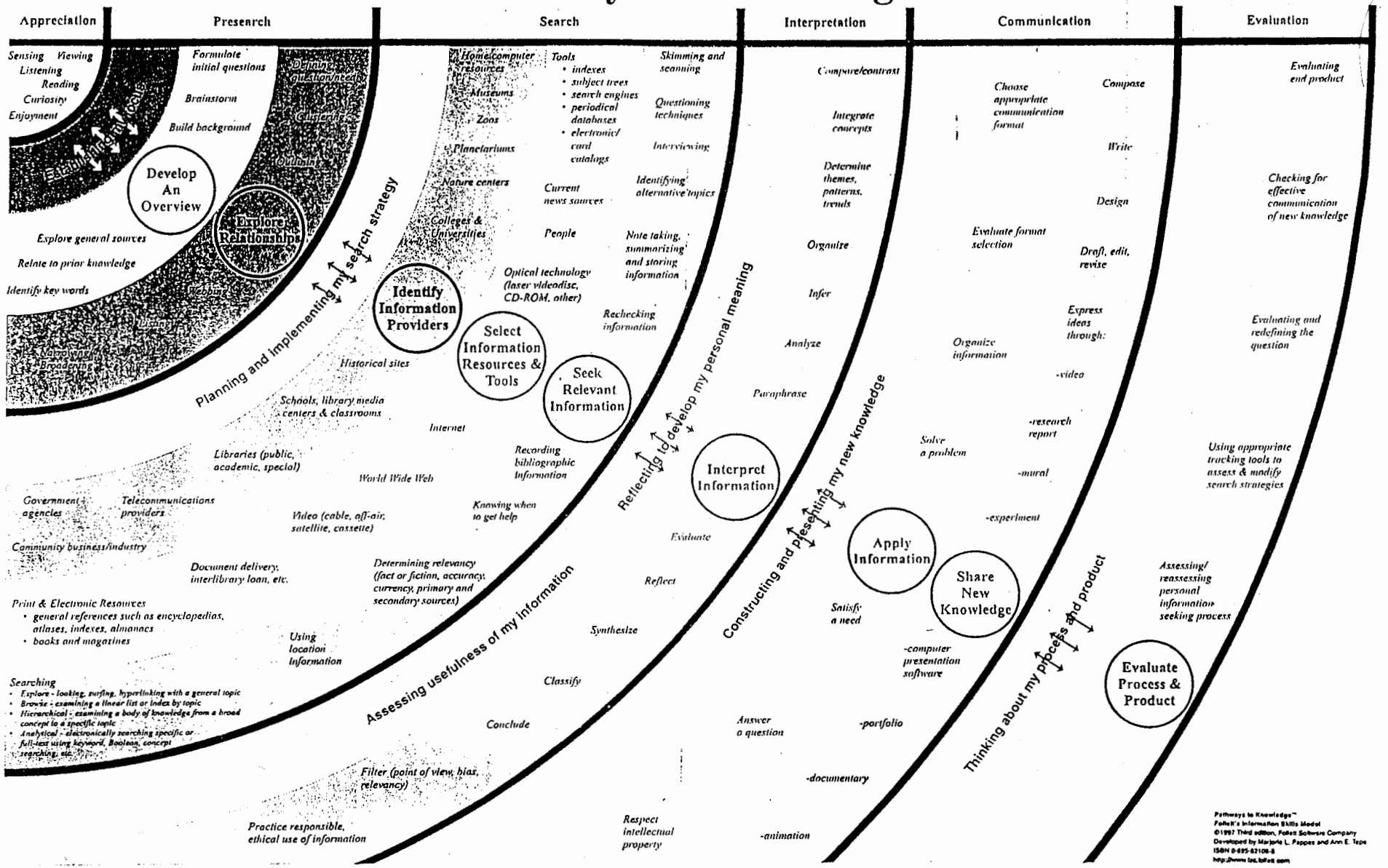
Figure 3: The Search Process

The Instructional Strategies

The third component of the information literacy model consists of the instructional strategies that might be generated in response to the learner's needs during the search process. The teacher introduces/suggests a particular strategy to meet a particular need rather than attempting to impose a fixed set of strategies on all searchers. Patterns of instructional support will vary depending on the searcher, the problem, and the resources.



California School Library Association. (1997). From library skills to information: a handbook for the 21st century. (2nd Ed.). San Jose, CA: Hi Willow Research and Publishing.



Follett's Information Skills Model

Pappas, Majorie L., & Tepe, Ann E., (1997). Pathways to knowledge: Follett's information skills model. McHenry, IL: Follett Software Company.

Got a problem to solve?

FLIP IT!

FOCUS:
Stop and think! Identify specifics.

LINK:
What do you already know?

INPUT:
Implement the Information you find.

PAYOFF:
Put it all together

for

Intelligent Thinking!

Yucht, Alice H., (1997). Flip It! An information skills strategy for student researchers. Worthington, OH: Linworth Publishing

FLIP IT!'s Four Strategic Markers:

Focus: Guideposts for the quest I'm on (specifying) (IF...)
- What is the real question or problem I'm trying to resolve?
- How can I narrow my target to save time and effort?
- What are the basic questions or issues I need to focus on in order to stay on task?
- What facts do I need to find? (THEN...)

Links: Connections to help me proceed (strategizing)
- What prior knowledge about this subject or process can I use to help me identify:
  - likely resources?
  - logical way to proceed?
  - layout of broader topic?
- Where and how can I locate the best information? (IF...)
- How can I use these connections most efficiently? (THEN...)

Input: Implementing the information I find (searching, sorting, sifting, and storing)
- What kinds of information do I need? Why?
- How do I interpret the information I acquire?
- How should I record and acknowledge what I have?
- How should I prioritize, categorize, organize, and utilize what I have learned?
- Do I have all the information I need? (IF...)
- What additional information do I need to make sense of what I now have?
- What inferences can I make? What new ideas do I now have to consider? (THEN...)

Payoff: Putting it all together for a profitable solution (sharing)
- Do I have a solution to my original problem?
- How can I present what I have learned?
- What kind of product is required? How do I produce what was asked for?
- Have I proved my ability to demonstrate my new understanding?
- What kind of profit do I think I can earn from these efforts?

and finally:

IT!: Have I demonstrated Intelligent Thinking throughout the process? (IF / THEN as reflection/evaluation)
- Does my final product answer my original Focus questions?
- What other possibilities might I consider?
- Does my final product reflect my best efforts? Why or why not?

Appendix C

Stripling & Pitts: Research Model (1988)

Metacogntion:

___X__Provides for strategies to monitor self progress

___X__Includes problem solving activities to allow students to develop own strategies to enhance learning.

___X__Allows for developmental growth

_____Includes problem solving strategies for improving memory, comprehension, and problems in communication.

Constructivism

_____Background experience is considered an integral part of learning (Allows students to draw on experience enabling them to link experience to new knowledge)

__X__Allows for collaborating

__X__Activities are authentic

__X__Is individual in nature

Process Education

__X__Allows for responsibility for ones own learning

__X__Emphasis on process rather than product

__X__Allows for cooperative learning

__X__Promotes discovery and creating of one's own knowledge

__X__Focuses on understanding and meaning rather than isolated concepts

Appendix C

Kuhlthau: Model of the Search Process (1989)

Metacogntion:

___X__Provides for strategies to monitor self progress

_____Includes problem solving activities to allow students to develop own strategies to enhance learning.

_____Allows for developmental growth

_____Includes problem solving strategies for improving memory, comprehension, and problems in communication.

Constructivism

__X___Background experience is considered an integral part of learning (Allows students to draw on experience enabling them to link experience to new knowledge)

__X__Allows for collaborating

_____Activities are authentic

__X__Is individual in nature

Process Education

__X__Allows for responsibility for ones own learning

__X__Emphasis on process rather than product

__X__Allows for cooperative learning

__X__Promotes discovery and creating of one's own knowledge

_____Focuses on understanding and meaning rather than isolated concepts

Appendix C

Eisenberg and Berkowitz: The Big Six (1990)

Metacogntion

__X__Provides for strategies to monitor self progress

__X__Includes problem solving activities to allow students to develop own strategies to enhance learning.

__X__Allows for developmental growth

_____Includes problem solving strategies for improving memory, comprehension, and problems in communication.

Constructivism

_____Background experience is considered an integral part of learning (Allows students to draw on experience enabling them to link experience to new knowledge)

__X__Allows for collaborating

_____Activities are authentic

__X__Is individual in nature

Process Education

__X__Allows for responsibility for ones own learning

__X__Emphasis on process rather than product

__X__Allows for cooperative learning

__X__Promotes discovery and creating of one's own knowledge

__X__Focuses on understanding and meaning rather than isolated concepts

Appendix C

Ann Irving: Information Skills Across the Curriculum (1992)

Metacogntion:

_____Provides for strategies to monitor self progress

__X__Includes problem solving activities to allow students to develop own strategies to enhance learning.

_____Allows for developmental growth

_____Includes problem solving strategies for improving memory, comprehension, and problems in communication.

Constructivism

_____Background experience is considered an integral part of learning (Allows students to draw on experience enabling them to link experience to new knowledge)

__X__Allows for collaborating

_____Activities are authentic

__X__Is individual in nature

Process Education

_____Allows for responsibility for ones own learning

__X__Emphasis on process rather than product

__X__Allows for cooperative learning

__X__Promotes discovery and creating of one's own knowledge

__X__Focuses on understanding and meaning rather than isolated concepts

Appendix C

California School Library Association Information Literacy Model (1994)

Metacogntion:

__X__Provides for strategies to monitor self progress

__X__Includes problem solving activities to allow students to develop own strategies to enhance learning.

_____Allows for developmental growth

_____Includes problem solving strategies for improving memory, comprehension, and problems in communication.

Constructivism

__X__Background experience is considered an integral part of learning (Allows students to draw on experience enabling them to link experience to new knowledge)

__X__Allows for collaborating

__X__Activities are authentic

_____Is individual in nature

Process Education

__X__Allows for responsibility for ones own learning

__X__Emphasis on process rather than product

__X__Allows for cooperative learning

__X__Promotes discovery and creating of one's own knowledge

__X__Focuses on understanding and meaning rather than isolated concepts

Appendix C

Pappas & Tepe: Pathways to Knowledge Information Skills Model (1995)

Metacogntion:

__X___Provides for strategies to monitor self progress

__X___Includes problem solving activities to allow students to develop own strategies to enhance learning.

_____Allows for developmental growth

_____Includes problem solving strategies for improving memory, comprehension, and problems in communication.

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__X__Emphasis on process rather than product

__X__Allows for cooperative learning

__X__Promotes discovery and creating of one's own knowledge

__X__Focuses on understanding and meaning rather than isolated concepts

Appendix C

Yucht: Flip It (1997)

Metacogntion:

_____Provides for strategies to monitor self progress

__X___Includes problem solving activities to allow students to develop own strategies to enhance learning.

__X___Allows for developmental growth

__X___Includes problem solving strategies for improving memory, comprehension, and problems in communication.

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