Information Literacy and Self-regulation: A Convergence of Disciplines

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Two fields of inquiry are examined in an effort to explicate the relationship between information literacy and self-regulation. A theoretical connection between these two areas of study is provided. Operational behaviors--such as the ability to select and use appropriate procedures during the learning process; to ask for help when at an impasse during the information search process; to select and evaluate selected strategies for specific goals, information needs, and personal success; and to adapt personal domain knowledge in light of newly acquired information--are presented as evidence linking these two fields of research. Implications of the interconnectedness between these two fields include increased understanding of the role information skills plays in the development of lifelong self-regulatory learning skills, increased inclusion of information literacy skills in the preservice education curriculum, and continued development of information literacy skills within discipline specific curricula.

Introduction

Information literacy is the ability to access, use, and evaluate information in an effective and efficient manner (American Association of School Librarians and Association for Educational communications and Technology 1998; California Media and Library Educators Association 1994; Eisenberg and Berkowitz 1988). Information-literate students are students who recognize that information is needed to solve problems, can frame information needs in the form of questions or decisions, and can acquire quality information from a variety of sources, depending upon the specific information need.

Self-regulated learning is learning that students themselves control (Zimmerman 1995). They determine goals and strategies to reach goals. Students manage motivation, actions, and results in order to achieve desired results. Self-regulated students are students who purposively select learning goals (Carver and Scheier 2000). They are aware of help options and appropriate times to access help, whether in the form of books, people, or

other formats. Self-regulated students are motivated, self-aware, and believe in their own control over success or failure in a particular situation (Pintrich 1995; Zimmerman 1994).

Researchers who study self-regulation acknowledge the diversity of this field (Boekaerts, Pintrich, and Zeidner 2000). Major lines of inquiry include investigations surrounding the psychological constructs of self-regulation (Demetriou and Raftopoulos 1999; Zimmerman 1995, 2002), domain-specific paradigms within self-regulation (Boekaerts and Niemivirta 2000; Alexander 1995; Vancouver 2000), and investigations into the measurement and systematic definition of self-regulation (Winne and Perry 2000). The interest in domain-specific characteristics of self-regulatory behavior, however, does not encompass the area of information literacy, a key construct of the school library media field.

This article will provide a theoretical and operational link between the fields of information literacy and self-regulation by examining the underlying theoretical constructs, the component cognitive and behavioral skills, and the operationalized behaviors that are discussed in the body of literature. As information becomes more readily available to students in a variety of formats, it is important for educational researchers and librarians to understand the behaviors and contributing factors that affect student success in various learning environments. Having a theory-based understanding of the relationship between self-regulation and information literacy may provide researchers and practitioners in both areas a common understanding so that innovations within libraries (both academic and research) and classroom settings can be developed.

Theoretical Constructs

In order to begin integrating information literacy and self-regulation, a review of the theoretical constructs comprising each field is warranted. This review is not intended to be exhaustive. Rather, it is intended to provide the reader with a basis of understanding for the supporting theories within each field, accompanying definitions, and a framework from which the integration process can be viewed.

Information Literacy

Information Literacy Defined. Information literacy is becoming ubiquitous within the school library community of practitioners and researchers. Most grade-level or subject-area educators, however, have an innate understanding of literacy, but when combined with information that understanding becomes clouded. Several definitions for information literacy have been developed by reputable agencies and researchers since the early 1990s (Abilock 2004, 2005; American Association of School Librarians and Association for Educational communications and Technology 1998; American Library Association 2005; Eisenberg, Lowe, and Spitzer 2004; Snavely and Cooper 1997). Common themes found in these definitions include the ability to recognize that information should be used to solve problems, the importance of basic information retrieval skills, the ability to be critical in the information use process, and the ability to use information across contexts or subject areas. One unique definition specifically addresses the transformation that

should occur in learners in order for information literacy to be considered an internalized characteristic. "Information literacy is a transformational process in which the learner needs to find, understand, evaluate, and use information in various forms to create for personal, social, or global purposes" (Abilock 2004, 10).

Information Literacy Models. As with other fields of research, experts in the field of information literacy have developed several models in order to more clearly communicate the complexity of this concept to practitioners. Three of the most well-known models are The Big Six Information Skills (Eisenberg and Berkowitz 1988), Information Search Process (Kuhlthau 1993), and Pathways to Knowledge (Pappas and Tepe 2002). Each of these models provides a unique way of examining information literacy.

The Big Six Information Skills is a skills-based model describing overarching, necessary tasks that students should master in order to be considered information-literate. Neither task- nor subject-specific, the model is based on the precept that students need to plan for information needs, execute the information search process, create a product or solution, and then evaluate the results that result from this effort. This model is intended for use by students, teachers, and school library media specialists in the PK-12 arena; however, it also can be implemented with students in college or university settings.

Kuhlthau (1993) describes information literacy in a more task-specific manner than do Eisenberg and Berkowitz (1988). Her model describes the process in which student-researchers engage while completing information search tasks. The Information Search Process illustrates information literacy through three different aspects of personal performance: thoughts that occur while researching, feelings that arise as a result of the search process, and typical actions that can be found at various stages of the search process. Kuhlthau identifies seven stages of the information search process, each of which has corresponding differences in the feelings, thoughts, and actions that are experienced by searchers. Searchers' feelings progress from uncertainty at the beginning , to a final feeling of either satisfaction or dissatisfaction. Searchers' also thoughts proceed along a continuum, from ambiguity at the point just after the search process begins, to specificity as it nears the end. At the same time, the actions that searchers exhibit progress from a focus on things that are relevant (having anything to do with the topic), to things that are pertinent (specific support of the topic) to the topic under investigation.

Both Eisenberg and Berkowitz (1988) and Kuhlthau (1993) illustrate information literacy in models that rely on the structure of text on paper in a two-dimensional manner. Pappas and Tepe (2002), however, use two dimensions to illustrate the three-dimensional information search process rather than a more linear one. Pathways to Knowledge (Pappas and Tepe 2002) employs the use of curvilinear bands to illustrate the relationship between skills associated with information literacy, while also providing for the need to create products based on information gathered during the search process. Pappas and Tepe (2002, 1) purposefully intended to illustrate the information search model in this manner:

> Professional information specialists (e.g., librarians) often pursue different pathways to finding and using information. ... It seems appropriate to teach students that a nonlinear approach is not only accepted but is the norm. A serious effort was made to design the Pathways model so that the nonlinear nature of the process would be evident in the graphic version.

Information-literate Students. Information literacy in students has been described in terms of specific and related skills that learners should possess in order to function in an information-literate manner. Information-literate students tend to posses skills that fall into three broad categories: those relating to accessing specific information, those relating to the use of information, and those relating to the evaluation of information (American Association of School Librarians and Association for Educational communications and Technology 1998).

Generally, information literacy skills are associated with three main areas: the ability to access, evaluate, and use information efficiently and effectively. Specific skills are grouped within these three main areas. Table 1 illustrates these skills. Each of the skills can be further subdivided into component parts. It is not uncommon to find these component parts and skills woven into national subject-area standards, courses of study, and other curriculum documents (American Association of School Librarians and Association for Educational communications and Technology 1998; American Library Association 2006). The relationship between subject-area standards and information literacy standards is illustrated in figure 1.

The ability to access information, to be able to find what is wanted or needed, is the cornerstone of information literacy. Without the ability to find information, no other aspect of using or evaluating that information or the products that are produced from it is possible. Skills associated with accessing information include developing appropriate research questions, developing appropriate search strategies to find needed information, locating specific information with a source, and modifying search strategies to account for initial success or failure in the information search process (American Association of School Librarians and Association for Educational communications and Technology 1998; Eisenberg and Berkowitz 1988; Pappas and Tepe 2002).

Once information has been accessed--that is, once it has been located--it can be used by the searcher. Information can be used to create such products as term papers or presentations, or it can be used to make such decisions as which college to attend or which car to purchase (Eisenberg and Berkowitz 1988). Pappas and Tepe (2002) define information use as a part of the Interpretation and Communication phases of their model. In these phases, the student internalizes new information and creates a new product in order to demonstrate understanding of a particular topic or question. Kuhlthau (2004) incorporates information use skills throughout her Information Search Process model, albeit in varying levels of relevance from the searcher's point of view. For instance, a student may start out accessing information that is relevant or "has to do with" a certain broad topic, and then would progress to the point of accessing specific information that is pertinent and applicable to a narrower topic at hand.

The final descriptor of an information-literate student is one who is able to evaluate information in a critical and competent manner (American Association of School Librarians and Association for Educational communications and Technology 1998). Skills such as the ability to recognize point of view, bias, relevancy, accuracy, and authority within an information source all comprise the ability to evaluate information (American Association of School Librarians and Association for Educational communications and Technology 1998; Eisenberg and Berkowitz 1988; Pappas and Tepe 2002). Also considered to be part of evaluation is the ability to determine which source is the better source of information when presented with two or more potential places to search for appropriate information in relation to a problem or task at hand. In addition to understanding the skills that comprise information literacy, an examination of the behaviors associated with information-literate behavior is warranted.

Information Literacy Behaviors and Dispositions. Certain behaviors and dispositions are associated with information literacy. For purposes of this discussion, skills are characteristics that can not be directly observed unless they are being demonstrated by a student. Behaviors are the actions that demonstrate skills. For instance, an information-literate student is one who has the skill of locating pertinent information within an information source. This skill can be demonstrated through the behavior of notetaking, highlighting, or other similar activity. Dispositions are attitudes or temperaments that would support the implementation of information literacy skills in a personally meaningful manner.

The behaviors associated with information literacy skills have been the focus of numerous studies examining the nature of interaction between learners and information sources, problems, and products (Marchionini 1989). Activities such as constructing and implementing online searches (Hill and Hannafin 1997; Marchionini et al. 1993) and writing research reports (McGregor 1993; Stripling and Pitts 1988) have been studied, as have as general studies that examine information searching behaviors in an attempt to fully understand its complexities (Eisenberg and Berkowitz 1988; Kuhlthau 1993; Marchionini 1989).

Dispositions related to information literacy are more complex to identify and define than behaviors or skills. These are the attitudes that set information-literate people apart from the bulk of learners or information searchers. Some researchers address dispositions within the evaluation portion of information literacy (American Association of School Librarians and Association for Educational communications and Technology 1998; Eisenberg and Berkowitz 1988). In this manner, learners posses an attitude of striving for excellence, choosing to evaluate their own process in addition to the product of an information problem solution. Additionally, the national information literacy standards address dispositions within the standards for "independent learner" and "socially responsible." Only the first set of standards addresses specific skills; the remaining standards utilize those skills in an applied manner.

Self-Regulation

Overview and Definitions. At the most general level, self-regulation can be defined as regulating the cognitive processes within oneself. Specifically, self-regulated learning has been described as a three-pronged approach to control of personal behavior, motivation and affect, and cognition (Pintrich 1995); active participation in the cognitive, motivational, and behavioral aspects of personal learning (Winne 1995a; Zimmerman 2001); and a "systematic process of human behavior that involves setting personal goals and steering behavior toward the achievement of established goals" (Zeidner, Boekaerts, and Pintrich 2000, 751). Common to each of these definitions is the idea of volition. That is, the student or learner referred to in each definition has a purpose or specific goal that guides behavior and cognition during the learning process.

Unlike specific content areas and information literacy, self-regulation skills are not explicitly stated in the form of a standards document. Rather, students are expected to exhibit a variety of self-regulatory behaviors during their tenure in school settings. These include the ability to manage learning time (Schunk and Zimmerman 1994), to employ specific study strategies (Winne and Hadwin 1998), and to request help when appropriate (Hacker, Dunlosky, and Graesser 1998). Students also must possess a certain degree of metacognitive awareness that allows them to understand their personal characteristics in relation to the school-related tasks at hand. Learners can exhibit these abilities as characteristic behaviors or dispositions.

Characteristics of Self-regulated Learners. Zimmerman (2001, 1) presents learning as self- regulated when "the learner displays personal initiative, perseverance, and adaptive skill in pursuing it." In other words, when a student is the driving force behind the learning, keeps trying in difficult situations, and changes learning tactics in order to be more efficient or effective, that student is exhibiting self-regulated behaviors. This view of self-regulated learning rests primarily on the motivation and adaptive skills of the learner. Winne (1995a) provides insight into the behaviors that are frequently observed in self-regulated students. These include the ability to routinize subject-specific processes and tasks; exhibit self-starting behavior, and accurately predict performance results prior to receiving feedback from a teacher. Additionally, self-regulated learners are reported as being highly aware of internal monitoring and control by being self-motivated and reliant on a routine method of learning (Zimmerman 1994). Specifically, self-regulated learners are better at planning a strategy for achieving an educational goal, implementing that strategy, monitoring its success, and distributing consequences to themselves than non self-regulated learners (Zimmerman 1994).

Two important dispositions relating to self-regulation are volition and effort (Winne 1995a, 1995b; Zimmerman 2000). A self-regulated student utilizes skills and strategies with volition; that is, they do something on purpose and with a specific purpose in mind. Likewise, they also persist at a task or problem until it is finished. This may entail the application of several strategies or skills, especially if the first choice is not successful.

Initiating Convergence of Information Literacy and Self Regulation

It is reasonable to assume that practitioners and researchers in each of the fields presented here might need a rationale for the convergence of these heretofore unlinked fields. The nature of field specificity in research circles is such that many times related information is not sought after by anyone outside a particular field. Also, researchers tend to focus on questions that have immediate impact in their own fields. When discussing this phenomenon within the field of self-regulation, Boekaerts and Niemivirta (2000, 2) offer, "A consequence of such domain or area specificity is that the information assembled about self-regulation is published in separate journals. ... a kaleidoscope of terms and labels exists and [these] may sound unfamiliar, even alien, to researchers who are not in that particular area." If this alien terminology exists within single domain, it is not unreasonable to see this effect across domains. The discussion that follows includes brief examinations of contextual presentations of each field, followed by a discussion that explains the commonalities between the two fields. Finally, instructional implications are provided for educators in both the K-12 and university arenas.

Information Literacy in Context

As discussed previously, information literacy skills can be found within the standards of specific content areas. These skills also are found within the greater school context. Tasks as mundane as completing individual homework assignments, and as complex as designing, implementing, and communicating about a semester-long research project, require students to successfully implement a variety of information literacy skills (Eisenberg and Berkowitz 1988).

Self-regulation in Context

Self-regulation researchers have identified certain tasks that may also be supported by strong information literacy skills. Open-ended tasks that are project- and research-based and require interpretation increase opportunities for students to increase motivation and engagement in specific subject areas. Consequently, this will affect attributions of success to effort rather than ability (Paris, Byrnes, and Paris 2001) Additionally, students expectations of themselves change with the requirements placed on them by teachers and various task settings. Paris, Byrnes, and Paris (2001) contend that differences in school expectations regarding assessment and evaluation can affect student expectations of self-ability, perceptions of task value, and relative importance of competition. However, students have difficulty with complex tasks requiring self-regulatory manner. One possible reason might be that students have difficulty making relationships between classroom tasks and the big picture in many subject areas. They fixate on the micro-level task, rather than on the macro-level concept (Paris, Byrnes, and Paris 2001).

Distinctive Characteristics of Self-regulation and Information Literacy

The convergence between self-regulation and information literacy can be though of as the description of the characteristics that populate the center section of a two item Venn diagram (see figure 2).

The main difference between the two fields rests in the specificity of information literacy and the attention to metacognition and motivation in self-regulation. Arguably, while an information-literate student also can possess metacognitive skills and awareness as well as being motivated in a general sense, the self-regulated student possesses these characteristics in a specific subject area or for a specific task. Also, the goal setting in self-regulation could relate to a variety of tasks such as the management of mental health issues and chronic illnesses (Boekaerts and Niemivirta 2000), not all of which pertain to school-tasks. The goal setting within information literacy is generally accepted as being related to an information problem or task (Abilock 2004; Doyle 1992; Eisenberg, Lowe, and Spitzer 2004).

Convergence of Self-regulation and Information Literacy

The commonalities between the two fields revolve around the application of regulatory tasks and procedures relative to particular task. Self-regulated learners monitor (Winne 1995a, 1995b, 2001) while information-literate learners evaluate (Eisenberg and Berkowitz 1988). Even though different terms are used, the process of examining a result or progress along a continuum and then adjusting actions based on that evaluation is described by both theories. Both fields recognize the developmental nature of acquiring information literacy and self-regulatory skills (Kuhlthau 2004), as well as the importance of finding information in appropriate sources in the form of reliance on scaffolding (Manning and Glasner 1996) or of help from human resources (Eisenberg and Berkowitz 1988; Kuhlthau 2004).

Instructional Implications

There are several implications of the convergence of these two fields of study. First, it is important to recognize that the development of self-regulatory skills and dispositions as well as the acquisition of information literacy skills is a developmental process that may not complete until well into adulthood (Kuhlthau 2004; Pressley 1995). As such, educators striving to develop these skills in students may want to consider adopting an integrated approach to them. This approach would combine overt instructional practices along with ample opportunity for situational practice of the skills in a global manner. This integrated approach has been advocated within the library media community for a number of years (American Association of School Librarians and Association for Educational communications and Technology 1998), and also is recognized as valuable within the field of self regulation:

> Do not have students learn and practice one new procedure at a time, but rather have them learn and practice several simultaneously, interspersing

> practice of each. Although such interspersal of practice may slow speed of acquisition of new procedures, durable knowledge and use of the new procedures may be increased (Pressley 1995, 211).

Secondly, educators and school library media personnel may want to consider borrowing instructional models from both fields when making decisions about developing teaching environments for students at all developmental stages. Both Winne and Hadwin (1998) and Eisenberg and Berkowitz (1988) use nearly identical terminology when describing the stages of self-regulation development and information literacy. These researchers all describe processes in terms of defining a specific task, planning and implementing a strategy for completion, and evaluation of the process or product in order to make decisions regarding adaptations that may or may not be required.

Finally, in order to better understand the learning and instructional needs of students in a particular learning environment, it may prove useful to create and implement assessments or inventories that can measure the self-regulatory or information literacy developmental stage of students. Researchers have been using a variety of methods to measure aspects of self-regulation for a number of years (Manning and Glasner 1996; Schunk and Zimmerman 1994; Winne 1995b). These inventories might be used as the basis for information literacy inventories that can be administered by school library media specialists and teachers in order to inform the teaching practices of both parties. Additionally, these inventories can be used as an additional measure of program effectiveness, especially when results are considered over time.

Paris, Byrnes, and Paris (2001, 256) provide support for the need to have structured development of self-regulation in students in order for student to be able to be well-assimilated into their culture:

> Participation [in a culture] is a key process in the enculturation into membership. One of the fundamental differences between successful and unsuccessful students is their access to effective learning practices because unequal access leads to different patterns of appropriation and use ... We emphasize the act of becoming a self-regulated person as part of the development of the individual in a group.

Additionally, the SCANS (1991) report and the American Library Association (1989) both advocate for the development of information skills so that students will be able to be productive members of an information-rich society. This position is best voiced from the American Library Association (1989, 1):

> Ultimately, information-literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand.

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Table and Figures

Table 1. Information literacy skills

Accesses Information	Evaluates Information	Uses Information
Recognizes the need for information	Establishes authority	Organizes information for practical application
Recognizes that accurate and complete information is the basis for intelligent decision making	Determines accuracy and relevance	Integrates new information into an existing body of knowledge
Formulates questions based on information needs	Recognizes point of view and fact/opinion knowledge	Applies information in critical thinking and problem solving
Identifies potential sources of information	Rejects inaccurate and misleading information	
Develops successful search strategies	Creates new information to replace inaccurate or missing information as needed	
Accesses print and technology sources of information		
Is a competent reader		

Figure 1. Selected Information Literacy Skills within Curriculum Standards

Information Literacy Standard	**Curriculum Connections**
... Accesses information efficiently and effectively (Recognize that information is the basis of decision-making, formulate questions, identify sources of information, access print & technology sources of information, etc.)	English: o Students conduct research on issues and interests by generating ideas and questions, and by posing problems ... o Students use a variety of ... information resources to gather an synthesize information and to create and communicate knowledge Social Studies: o Students locate, access, analyze, organize and apply information about selected public issues ... Math: o Students pose questions and collect, organize, and represent data to answer those questions Science: o Students identify questions and concepts that guide scientific investigations o Understand that scientists conduct investigations for a wide variety of reasons Technology: o Students use technology locate, evaluate, and collect information from a variety of sources o Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks o Students use technology resources for solving problems and making informed decisions
… Evaluates information critically and competently (Establishes authority,	English: o Students apply a wide range of strategies to comprehend

determines accuracy and relevance, rejects inaccurate & misleading information, crates new information to replace inaccurate or missing information, etc.)	interpret, evaluate, and appreciate texts ... Social Studies: o Students locate, access, analyze, organize and apply information about selected public issues ... o Students recognize and interpret varied perspectives about human societies and the physical world using scientific knowledge, ethical standards, and technologies from diverse world cultures Math: o Students monitor and reflect on their mathematical thinking in solving problems o Students apply a wide variety of strategies to solve problems and adapt the strategies to new situations Science: o Students formulate and revise scientific explanations and models using logic and evidence Technology: o Students use technology locate, evaluate, and collect information from a variety of sources o Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks
... Uses information accurately and creatively (Applies information in critical thinking and problem solving, Organizes information for practical application, Integrates new information into an existing body of knowledge)	English: o Students conduct research on issues and interests ... they gather, evaluate and synthesize data from a variety of sources to communicate their discoveries in ways that suit their purpose and audience. o Students use a variety of ... information resources to gather an synthesize information and to create and communicate knowledge o Students read a wide range of print and non print texts ... to acquire new information ... Social Studies:

	o Students explain and apply ideas and modes of inquiry drawn from behavioral science and social theory in the examination of persistent issues and social problems o Students formulate strategies and develop policies for influencing public discussions associated with technology-society issues ... Math: o Students pose questions and collect, organize, and represent data to answer those questions o Students apply a wide variety of strategies to solve problems and adapt the strategies to new situations Science: o Students design and conduct a scientific investigation o Students use technology and mathematics to improve investigations and communications. o Students communicate and defend a scientific argument Technology: o Students use technology for solving problems and making informed decisions o Students employ technology in the development of strategies for solving problems in the real world

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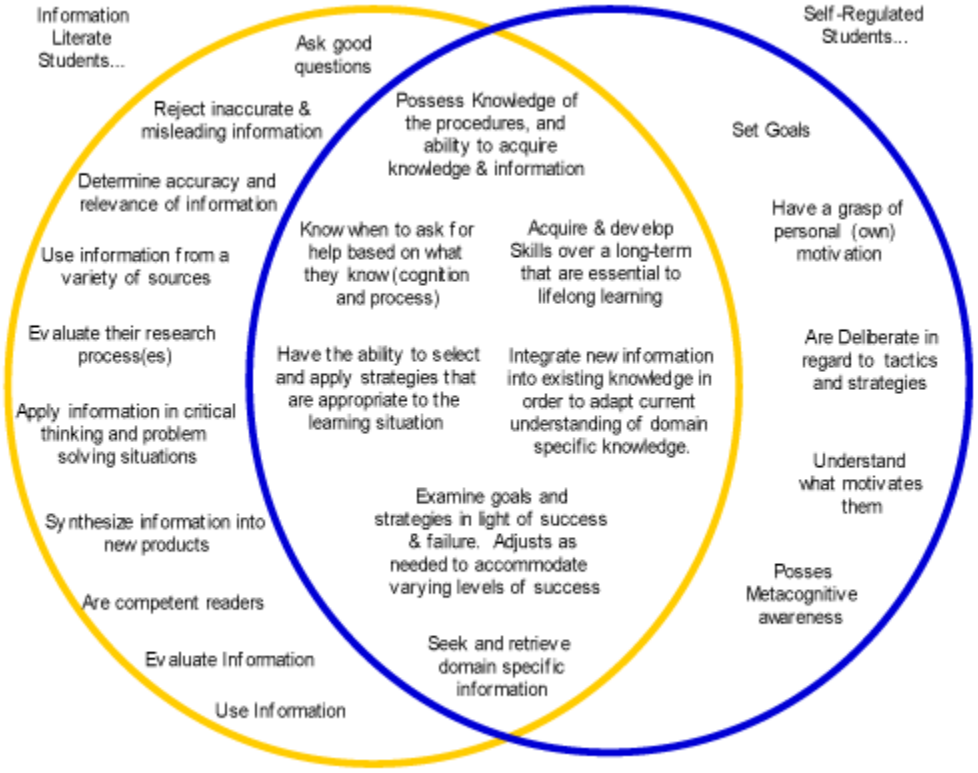
Figure 2. Convergence of self-regulation and information literacy



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