Informing Policy: Mapping Information Literacy Research to Education Policy

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Abstract
Information literacy, defined as the skills and stages of successful information problem-solving, is often cited as a goal of education efforts at every level, pre-kindergarten through higher education. For these efforts to be effective, they must be guided by empirical research on information literacy. This study sought to determine the extent to which evidence of how students develop information literacy skills gleaned from empirical research is explicitly represented in a high-profile education policy initiative, the Common Core State Standards. Results reveal that not all stages of the information problem-solving process are represented in these standards, and that the crucial stage of Task Definition is not explicitly represented at all. Implications and directions for future research are presented.
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1 Introduction

Successfully using information to accomplish tasks or solve problems, that is, information literacy, is crucial in an information society (American Library Association, 1989). In the digital age, the challenge shifts from seeking and finding information to the use of information to efficiently and effectively solve information problems. Since the concept was first identified by Paul Zurkowski in his address to the Information Industry Association in 1974 (Zurkowski, 1974), the value of information literacy has been established in scholarly literatures (Bruce, 1997; Chevillotte, 2010), professional practice (Association of College & Research Libraries, 2008), and pedagogy (Grassian & Kaplowitz, 2009; Julien, 2005). Moreover, in October 2009, the Presidential Proclamation of National Information Literacy Awareness Month in the United States established information literacy as a national priority (Obama, 2009). Successful solutions to problems personal, societal, and global will depend exclusively upon each individual's degree of information literacy. In an overview of information literacy instruction, Grassian & Kaplowitz (2009) state: "In an era when new technologies and sources of information proliferate at breakneck speed, being information literate is not a luxury or a casual pastime. It is an essential survival skill for a changing world" (p. 2429).

In order for students to be prepared for college and career readiness in the digital age, they must be information literate; thus, the goal of information literacy and related skills must be explicit in education policy documents. For example, information skills are key components of the Framework for 21st Century Learning, developed by the Partnership for 21st Century Skills, "a broad coalition made up of education nonprofits, foundations, and businesses working together to make 21st century education a reality for all students" (Partnership for 21st Century Skills, 2013).

The Common Core State Standards (CCSS) Initiative in the United States is a high-profile education policy initiative seeking to establish a single set of clear educational standards for kindergarten through 12th grade in English language arts and mathematics. The standards were developed through the National Governors Association and the Council of Chief State School Officers, and have been voluntarily adopted by forty-five states, the District of Columbia, four territories, and the Department of Defense Education Activity to date (National Governors Association & Council of Chief State School Officers, 2013). The standards are comprehensive, setting expectations for reading, writing, speaking and listening, language

and mathematics for grades K-12. From the CCSS Initiative mission statement: "The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy." The CCSS Initiative also claims that the criteria by which the standards were developed include evidence and scholarly research (National Governors Association & Council of Chief State School Officers, 2013, FAQ). This study seeks to investigate this claim.

Given the value placed on information literacy in the U.S. (Obama, 2009), and the impact of what has become a national education policy initiative, this study sought to determine the extent to which evidence of how students develop information literacy skills gleaned from empirical research is explicitly represented in the CCSS Initiative. The first goal was to detect evidence of any of the skills or stages of the information problem-solving process, as described by the Big6 information literacy process model, in the CCSS Initiative; the second goal was to detect evidence of the skills related to the particular stage of Task Definition.

1.1 Describing Information Literacy Behaviors

Decades of research on information literacy have contributed to an understanding of how people successfully access, evaluate, use, and share information to answer questions, complete tasks, and solve problems. Information literacy may be described as the skills and stages of the information problem-solving process; that is, those who are successful at each stage of the information problem-solving process are information literate. Models of information problem-solving behavior include Kuhlthau's Information Search Process (2004) and Eisenberg & Berkowitz' Big6 information literacy process (1990). Several studies have adopted an information problem-solving model as an operational definition of information literacy. In reviewing the skills necessary for life in an information society, Brand-Gruwel (2005) concludes: "All the skills, knowledge and attitudes, which are needed…can be defined as information literacy…or as information problem-solving" (p. 488). These models provide a framework for organizing the many aspects of information behavior as described by Wilson (1999) and focus for an investigation of information literacy.

The Big6 information literacy process (Figure 1) by Eisenberg & Berkowitz (1990), describes the process of successfully solving an information problem. This model describes the first stage as Task Definition, in which the problem-solver defines the task or problem to be solved, and then identifies the information needed to solve the problem. From there, the problem solver engages in information seeking strategies, location and access of information, use of information, information synthesis, and evaluation of the process and product. The process is often not linear, and stages may be repeated throughout the process. The development of the Big6 was informed by practice, but it has been employed as a conceptual framework in several studies of information problem-solving (Brand-Gruwel et al., 2009; Gerjets & Hellenthal-Schorr, 2008). Brand-Gruwel et al. (2005) studied expert and novice higher education students in an effort to decompose the Big6 information literacy approach into cognitive components, and to determine the key components in the information problem-solving process. They conclude that the Big6 information literacy approach was an accurate description of stages in information problem-solving, and useful in the decomposition of cognitive components into related categories. Murray (2008a, 2008b, 2010, 2011) has done extensive work aligning various standards to the Big6 model. Neither Kuhlthau's ISP (2004) nor other models have been aligned to the standards.

Stage	Sub-stages	Actions
1. Task Definition	1.1 Define the information problem 1.2 Identify information needed (to solve the information problem)	What is my current task? What are some topics or questions I need to answer?

		What information will I need?
2. Information Seeking Strategies	2.1 Determine all possible sources (brainstorm) 2.2 Select the best sources	What are all the possible sources to check? What are the best sources of information for this task?
3. Location and Access	3.1 Locate sources (intellectually and physically) 3.2 Find information within sources	Where can I find these sources? Where can I find the information in the source?
4. Use of Information	4.1 Engage (e.g., read, hear, view, touch) 4.2 Extract relevant information	What information do I expect to find in this source? What information from the source is useful?
5. Synthesis	5.1 Organize from multiple sources 5.2 Present the information	How will I organize my information? How should I present my information?
6. Evaluation	6.1 Judge the product (effectiveness) 6.2 Judge the process (efficiency)	Did I do what was required? Did I complete each of the Big6 Stages efficiently?

Table 1: Big6 Information Literacy Process (Eisenberg, 2007)

1.2 Information Literacy Research

Research on information literacy, from library and information science and cognate fields, contributes to an understanding of information behaviors that lead to learning and successful problem-solving, and informs pedagogical practice and education policy. Rather than focus on one area of human information behavior, the study of information literacy takes a comprehensive approach to the examination of information behavior that results in successfully completing a task, answering a question, or solving a problem. Such a process approach enables the identification of particular practices that lead to, or thwart, successful outcomes.

In a series of studies, Head & Eisenberg (2012; 2009a, 2009b, 2010a, 2010b) provide the most current insights into the information literacy practices of young adults in higher education. Among the findings from these studies is that students seek context for their course-related and everyday life-related research. Students need context in order to formulate the problem situation and generate a plan for resolution; the information problem is situated within a context that is crucial to recognize. A related finding is that college students report difficulty at the initial stage of the research process. These studies also find that students are rather savvy with the information systems and services available to them, yet they rely on a small and familiar set of resources, a rote method for conducting research activities, and experience difficulty getting started. Gross (2005, 2007) found that students tend to overestimate their information literacy skills. Many students likely equate information literacy with just one stage of the entire process, the location and access of online information, without regard for the other crucial stages of the information problem-solving process.

1.3 Task Definition: A Crucial Stage in Successful Information Problem-Solving

While research on information literacy investigates information behaviors across the entire process of information problem-solving, a pattern emerges—a pattern indicating that the initial stage of Task Definition is worthy of further investigation. According to Eisenberg & Berkowitz (1990): "Most people spend too little time on task definition. The tendency is to push ahead even though they have only a general or vague understanding of what it is they are seeking to accomplish. By spending time considering the

information problem and then articulating a clear understanding of (a) the information problem and (b) specific information needs related to that problem, people can move much more efficiently toward solutions" (p.6). Skill at the initial stage of the information problem-solving process is crucial to success, and that difficultly at this stage typically leads to inefficient and ineffective information behaviors in later stages of seeking, search, and use.

This pattern is corroborated by research in cognate fields. Literature from the learning and cognitive sciences reveals that domain experts are more successful at solving problems within their domain because they are more effective at the initial phase of the problem-solving process, termed problem representation (Blessing & Ross, 1996; Chi, 2006; Hardiman et al., 1989). The knowledge of domain experts is organized differently than that of novices, and is brought to bear more effectively on problem-solving situations than that of domain novices (Bransford et al., 2000). Domain experts categorize problems according to type through analogical reasoning, and these types are described by the concept of schema (Novick & Bassok, 2005). Within problem schema is embedded a solution strategy for successful solution to the problem (McNamara, 1994; Novick, 1988). Bransford et al. (2000) recognize the importance of the initial stage of problem representation: "An important aspect of learning is to become fluent at recognizing problem types in particular domains…so that appropriate solutions can be easily retrieved from memory" (p. 44). Thus, research from multiple fields indicates that skills associated with the initial stage of Task Definition are crucial to eventual success in information problem-solving.

Again, empirical research on learning and problem-solving serves to inform instructional practice and education policy. These findings are directly relevant to the way in which students in pre-Kindergarten through higher education programs are taught to access, evaluate, use and share information for the purpose of answering questions, completing tasks or assignments, and solving problems.

1.4 Common Core State Standards

Applied to education policy, the term standards implies both a model of achievement and the gauge by which the achievement is measured. Typically, educational standards represent the opinions of experts on what students are capable of and should be doing at a particular grade level (Lee, 2002; Porter, Polikoff, & Smithson, 2009). Standards establish what is to be learned, the defined goals and objectives for instruction and learning; there are often established for each subject and grade level by state agencies and subject area associations. The national standards movement in the U.S. emerged out of the educational reform movement of the 1980s and 1990s that was sparked by the report, A Nation at Risk (National Commission on Excellence in Education, 1983). The Elementary and Secondary Education Act of 2001, commonly referred to as the No Child Left Behind Act, required testing and the development of state standards. As a result, all fifty states set their own educational standards. These standards varied in quality (Carmichael, Martino, Porter-Magee, & Wilson, 2010). According to (Goertz, 2010): "Policy makers must reach consensus on the type, content, and specificity of the standards; determine who will develop the standards; and facilitate the implementation of the standards" (p. 52).

Standards have frequently been created by a group of designated experts (Ballard, 2009; Barnett, 2008; Lee, 2002). Six U.S. national professional organizations, the American Association of School Librarians (AASL), the International Society for Technology in Education (ISTE), the National Center for History in the Schools (NCHS), the National Council for the Social Studies (NCSS), the National Council of Teachers of Mathematics (NCTM), and the National Research Council (NRC), each designated a task force of experts to develop a set of standards within their domain. According to Goertz (2010), the NCTM has used consensus methods to develop standards. The United States History Standards were developed through a "broad-based national consensus building process" (National Center for History in the Schools, Crabtree, & Nash, 1994, p. iii). Consensus-building appears to be the method used by the other professional organizations as well for developing standards sets. This consensus-building process has led to the criticism of standards

as being bloated, since compromise has equated to addition without subtraction (Lee, 2002; Marzano & Kendall, 1996, 1998; Phillips, 2009; Schmoker & Marzano, 1999). Phillips (2009) has characterized this criticism of standards creation calling the process a "political sausage factory, in which the most important goal is to respect each individual committee member's personal, cherished opinions" (p. 28).

There is little research that supports placement of particular content at a particular grade level (Kendall, 2001). According to Zenger & Zenger (2002): "No solid basis exists in the research literature for the ways we currently develop, place and align educational standards in school curricula. If this sounds shocking, it should not. The same holds true for placing subject-matter content at specific grade levels (scope and sequence)" (p. 212). Content has been placed in scope and sequence documents based on tradition, individual teachers' expertise, because it is the textbook, professional judgment, or current practice and standards documents appear to be no different (Zenger & Zenger, 2002, 2003).

The current state of the standards movement in the U.S. is the establishment of the Common Core State Standards (CCSS) Initiative. The CCSS were written by convening work groups comprised of experts in content areas, teaching, researchers, and other interested stakeholders. These work groups drew on existing state standards and their own experiences to draw up the CCSS. Criteria used to develop the CCSS required that they be rigorous, clear and specific, teachable and learnable, measureable, coherent, and internationally benchmarked (National Governors Association & Council of Chief State School Officers, 2013).

The CCSS are replacing the former standards sets in forty-five states. It is important to find out if the shortcomings of previous sets of standards have been addressed. According to the Standards Setting Considerations, "21st century skills" have been implemented where possible (National Governors Association & Council of Chief State School Officers, 2013). These skills are not a separate set of standards but incorporated into the various disciplines within the standards. Two of the 21st century skillsets are information literacy and problem-solving (Partnership for 21st Century Skills, 2009). This paper examines the CCSS for the inclusion, or exclusion, of explicit references to information problem-solving skills.

1.5 Research Questions

As an education policy initiative dictating the learning expectations for students in grades K-12 and adopted by forty-five states, the District of Columbia, four territories, and the Department of Defense Education Activity, the CCSS Initiative represents a major education policy statement. The overarching goal of the research described in this paper is to cite evidence that research on information literacy is indeed reflected in this policy. This study first seeks to identify explicit references to the skills or stages of the information problem-solving process, as described by the Big6 information literacy process, in the CCSS Initiative. It then seeks to identify explicit references to the skills related to the particular stage of Task Definition.

The following research questions emerge from this problem space:

1) Which stages of the information problem-solving process, as described by the Big6 Skills, are reflected in the Common Core State Standards Initiative?
2) How are skills specific to the initial stage of Task Definition in the information problem-solving process reflected in the Common Core State Standards Initiative?

2 Method

2.1 Research Design

The CCSS standards were analyzed as part of an exploratory content analysis. This was one phase of a larger research process categorizing standards from both the CCSS and the American Association of School Librarians (AASL) into the corresponding stage of the Big6 information literacy process. This sorting method was chosen in order to have multiple individuals with expertise in information literacy reviewing

the standards statements and assigning the standards statements to Big6 stages. It combined both a straightforward system with increased assurance that the standards statements assigned to a particular Big6 stage belonged to that stage rather than if one or two individuals had assigned the standards statements to Big6 stages.

The researcher identified and recruited five content analysts with expertise in information literacy to serve as coders (see Figure 2). Initial contact and all communications were by email.

Team Member	Expertise
1	National Board Certified Social Studies teacher; doctoral candidate in Information Science
2	School librarian, Information School lecturer; doctoral candidate in Information Science
3	Research Assistant, National Center on Quality Teaching and Learning; School librarian and a classroom teacher; doctoral student in Information Science
4	School Librarian, Information School lecturer; doctoral student School of Education
5	Director of Library and Media for state level office of Superintendent of Public Instruction.

Table 2: Content Analysts Qualifications

This study uses the term "standards statement" to describe a discrete statement of what a student should be able to do or know. This is equivalent to the AASL term "benchmark" and the CCSS use of the phrase "grade-specific standard." The CCSS standards statements were chosen from Grades 2, 5, and 8 for grade-level correspondence with AASL standards statements in order to make an equivalent comparison at a later date.

The CCSS are made up of strands, anchor standards, and grade-specific standards; as noted, this research focuses on the grade-specific standards and refers to these as standards statements. Content analysts were asked to review all the CCSS standards statements (377) in English/Language Arts and Mathematics for Grades 2, 5, and 8, and categorize them according to stages of the Big6 information literacy process.

Survey instruments were created using IT Connect Catalyst tools from the University of Washington for each content sub-area of the CCSS. Examples of these areas from English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects include: Reading Standards for Literature K-5, Reading Standards for Informational Text K-5, Writing Standards, Speaking and Listening Standards K-5, and Language Standards 6-12. Examples from Mathematics include: Operations and Algebraic Thinking, Numbers and Operations in Base 10, and Geometry. A total of 15 separate surveys were created.

2.2 Data Collection

Content analysts independently reviewed 377 CCSS standards statements grouped into 15 surveys. Analysts sorted each of the standards statements into a stage or sub-stage of the Big6 information literacy process (see Figure 3 for example); analysts were given the choice to identify the standards statement as "not related" to the Big6. Moreover, analysts were able to evaluate standards statements as "Unable to tell" for statements that were ambiguous or poorly-worded and not clearly aligned with any stage or sub-stage.

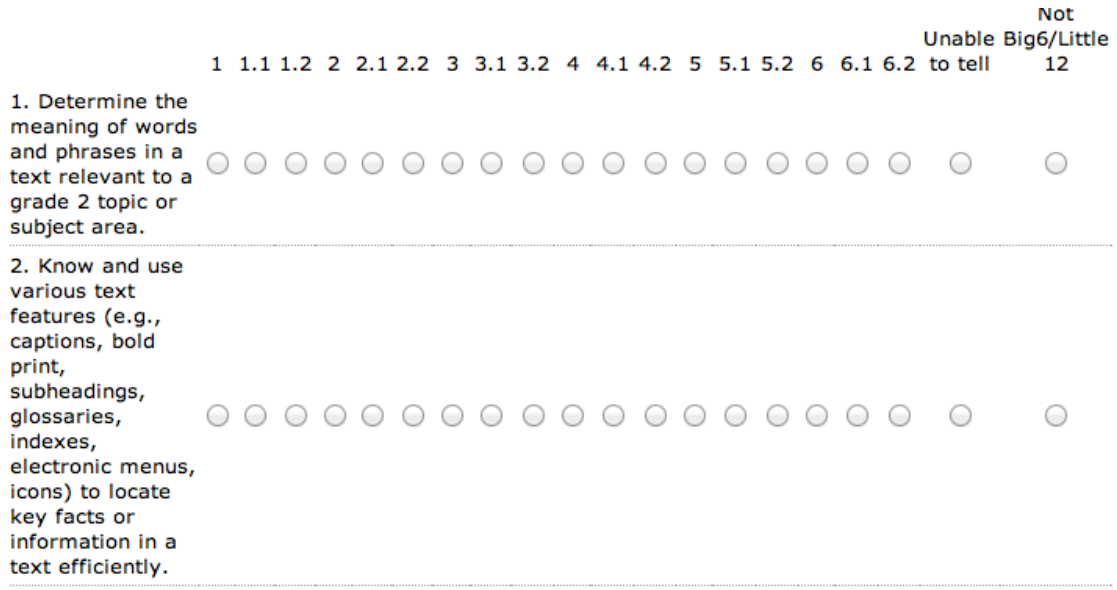

Figure 1: English/Language Arts Informational Text to Big6 Stage Rating Chart.

After all 15 surveys from each of the five content analysts were submitted to the researcher, a 60% level of consensus was used to determine where each item fit into the Big6 stages. This meant that three out of the five team members agreed that the individual standards standard fit into a particular Big6 stage. In some instances team members choose different sub stages of the Little 12 within the same Big6 stage but since the end result sought was categorization at the Big6 level these variations within categories are not discussed here. The researcher then tabulated the results (see Figure 4). In Row 1, the standards statement was categorized as Big6 Stage 4, Use of Information, while in Row 2, the standards statement was categorized as Big6 Stage 3, Location and Access.

Using a 60% level of consensus, 81% of the 377 CCSS standards statements were able to be categorized into either a Big6 stage or into the Not Able to Tell/Not Big6 category. This compared to only 41% being so categorized when using a consensus level of 80%. The 60% level of consensus was chosen in order to maximize the number of standards statements included in the research project. The researcher made a decision to err on the side of including more standards statements rather than to omit standards statements.

Row 1:
1. Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.

Possible points: 0

Participant	*Date*	*Response*

Date	*Response*
4/07/2013 1:31 PM	Not Big6/Little 12
4/12/2013 9:18 AM	4.1
3/24/2013 10:20 AM	4.1
4/06/2013 8:38 PM	4.1
3/20/2013 9:36 AM	Not Big6/Little 12

Participant information (email address) has been omitted.

Date	Response
4/07/2013 1:31 PM	4.1
4/12/2013 9:18 AM	3.2
3/24/2013 10:20 AM	3.2
4/06/2013 8:38 PM	3.2
3/20/2013 9:36 AM	3.2

Figure 2: Sample Results

2.3 Results

The final tally of CCSS standards statements categorized into Big6 stages is shown in Figure 5. At this stage, we are reporting on the number of standards in each Big6 category, using a simple tally system with the goal of detecting patterns, not statistical significance. As noted, the intent here is to determine what is present in the CCSS in terms of the information literacy skill or stage as represented by the Big6 information literacy process model.

Figure 5 shows that, according to this team of content analysts, the CCSS has an emphasis on Big6 Stage 5 (Synthesis), and to a lesser degree Stage 4 (Use of Information). However, it is also apparent that no CCSS are related to Big6 Stages 1 (Task Definition), 2 (Information Seeking Strategies), or 6 (Evaluation). Of the 122 standards statements that we placed into a Big6 stage out of 377, 86 were at Big6 Stage 5 (Synthesis), another 33 were at Stage 4 (Use of Information), and 4 were at Stage 3 (Location and Access). There were no CCSS standards statements that were categorized into the remaining Big6 stages.

NB = Not Big6; NC = No Consensus

Title	# Stds	Big6 Stage 1	2	3	4	5	6	NB	NC
ELA History/Soc Sci/Tech Writing	20	0	0	0	1	12	0	6	1
ELA History/Soc. St Reading Literature	10	0	0	0	1	3	0	2	4
ELA Information Text	30	0	0	1	7	10	0	4	8
ELA Language	70	0	0	3	5	2	0	50	10
ELA Literature	27	0	0	0	5	3	0	12	7
ELA Reading Standards Foundational Skills	17	0	0	0	4	0	0	13	0
ELA Science & Technical Reading Literacy	10	0	0	0	5	2	0	2	1
ELA Speaking & Listening	29	0	0	0	3	13	0	7	6
ELA Writing	61	0	0	0	2	30	0	23	6
Math Geometry	19	0	0	0	0	2	0	11	6
Math Measurement & Data	20	0	0	0	0	4	0	9	7
Math Number System 8th Grade	24	0	0	0	0	5	0	16	3

Math Numbers & Operations Fractions	13	0	0	0	0	0	0	7	6
Math Numbers & Operations in Base 10	20	0	0	0	0	0	0	16	4
Math Operations & Algebraic Thinking	7	0	0	0	0	0	0	5	2
Totals	377	0	0	4	33	86	0	183	71

Table 3: Common Core State Standards by Big6 Category

3 Discussion

This study first sought to determine if the skills or stages of the information problem-solving process, as described by the Big6 information literacy process, were evident in the CCSS statements. It then sought to determine if the crucial skills related to the initial stage of Task Definition were evident in these standards statements. At a broader level, this study sought to find evidence that current research on information literacy is reflected the CCSS Initiative. The CCSS Initiative is an important education policy initiative in the United States as 45 states have adopted these educational standards and will be modifying curricula and assessments to align with them. A goal of the CCSS Initiative is to prepare students for college and career readiness in the information age. Many authors have argued that information literacy skills are an important skillset for students in the 21st century.

The method used was an exploratory content analysis to examine how standards statements from the CCSS could be categorized into the Big6 information literacy process model by a team of content analysts with expertise in the conceptual and pedagogical aspects of information literacy. The results were analyzed to identify areas of consensus; 123 standards statements from the CCSS corresponded to stages of the Big6 model, according to the content analysts.

The standards statements of the CCSS provide clear evidence of incorporating Big6 Stage 5 (Synthesis)—the most frequently-identified Big6 stage, showing up 86 times. The stage of Synthesis is where students organize and present the information they have found, in the process creating their own new and unique answer to the information problem. Examples of Synthesis in the CCSS are included in Figure 6 below. Additionally, both Big6 Stages 3 and 4 were also present in the CCSS, though to a lesser degree. These represent the location and access of information, and engaging with and extracting relevant information. These skills go beyond rote memorization—they require students to apply their knowledge and create new products.

Approximately half of the CCSS standards statements did not fit into the Big6 information literacy process model. It is clear from Figure 5 that one reason for this is that the CCSS Math standards statements, representing about one quarter of the total, contained only 11 standards statements that were related to information problem-solving. This in itself is surprising, as it would seem that Task Definition would be an important part of problem-solving in Math. One possible explanation for this is that the team was unable to reach consensus on 28 of the Math standards statements; while indeed applicable, the Big6 is not typically applied to mathematical problems.

The crucial stage of Task Definition, according to studies in various fields, is undetectable by content analysts in this study. Problems assigned in schools tend to be well-structured problems. Well-structured problems have clear parameters and often have known, or correct, answers. In this environment, the problem is frequently seen as being assigned by the teacher and the student's responsibility is to find the answer. This reliance on well-structured problems is a possible explanation for the lack of the Task Definition stage in the CCSS. School is a formal learning environment, and as such the problems presented to students tend to be well-structured problems with a known solution that students are supposed to reach.

Informal learning environments outside of school have ill-structured problems that often have no single answer or competing answers of relatively equal value. To prepare students for their future, we want them to be able to solve these ill-structured problems that are typical everyday-life problems, not just the well-structured problems that students encounter in formal learning environments. One of the goals of education is the transfer of learning to new situations. Being able to analyze a problem and define what information is needed and what needs to be done to solve the problem is the most important part of information problem-solving, yet explicit standards for doing this are not apparent in the CCSS.

Explicit evidence of two other stages is also missing. Big6 Stage 2 (Location and Access), is an important skill for students to possess. Students must be able to identify potential sources of information for a particular problem and know how to obtain access if they are to deal with an information problem successfully. Big6 Stage 6 (Evaluation), enables students to identify both when they have completed a project successfully and what areas could be improved in future work. The lack of these skills seems to reflect a reliance on a well-structured problem model of education. Students in this model have information provided for them, though they are expected to use the information and to synthesize some type of product based on it. Additionally, in this model the teacher is seen as the evaluator, thus de-emphasizing student self-evaluation.

The CCSS Initiative does include a set of standards that are related specifically to research skills. These are based on the Anchor Standard, "Research to Build and Present Knowledge." However, these research standards make only a weak attempt to go beyond Big6 Stages 4 and 5. There are a total of 15 standards statements in this category across grades 2, 5, and 8. This anchor statement is included in both the strands of Writing and Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6–12, resulting in some duplication of standards statements. These 15 statements included three standards statements at Big6 Stage 4, two at Stage 5, five that the team rated as "Unable to tell," and five that the team did not reach a consensus. Many of these statements incorporate multiple concepts in one statement, thus making it difficult to identify the main thrust of the statement and to identify with a particular Big6 stage. This lack of clarity also suggests that practitioners may have difficulty identifying concretely what students are to accomplish.

Example	CCSS Statement	Big6 Stage
1	Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.	Stage 3 Location and Access
2	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	Stage 4 Use of Information
3	Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.	Stage 5 Synthesis
4	Provide a concluding statement or section that follows from and supports the argument presented.	Stage 5 Synthesis

Table 4: Comparison of CCSS to Big6 Equivalents

4 Conclusion

This conclusion includes a discussion of the limitations of this research, its implications, and areas of future research.

4.1 Limitations

This research focused on CCSS in grade levels 2, 5, and 8. It is unknown which Big6 stages are represented in CCSS at other grade levels. The research did not attempt to look at CCSS in the high school grades and it could be that areas of the Big6 information literacy process that are completely lacking in grades 2, 5, and 8, such as Task Definition, are present in standards for grades 9-12.

A second limitation was the group of experts recruited for content analysis. This group consisted of only five members, and though it did include members with expertise at a variety of grade levels and in librarianship, their experience was greater in library skills than in classroom teaching. A different group made up of those with different types of teaching experience might categorize the CCSS in a different manner. Additionally the sorting methodology used was intended to be straightforward and aimed at erring on the side of including standards statements into the Big6 stages rather than attempting a definitive identification of standards statements into appropriate Big6 stages.

Also, finding alignment between Big6, which are process stages, and CCSS, which are outcomes, may be problematic. Many of the process stages described by the Big6 information literacy process are likely implied in the CCSS statements, but not explicit in the standards statements.

4.2 Implications

The CCSS Initiative may be insufficient to meet the goal of preparing students for college and career readiness. The most important step in information problem-solving is identifying the task and the CCSS Initiative simply does not address this stage.

Additionally, it is possible that school districts may reduce the use of teacher-librarians as instructors through interpreting the CCSS's claim to incorporate 21st century skills as meaning students will learn information problem-solving skills through classroom instruction that is informed by the CCSS Initiative. This would be a mistake as information problem-solving skills are inadequately represented in the CCSS.

This study indicates that adding specific standards in the CCSS that are related to all six of the stages of information problem-solving are necessary to fully prepare students to meet the challenges of the 21st century. The CCSS Initiative could be improved by clearly developing standards that address each stage of the information problem-solving process.

4.3 Future Research

The first area for further research will be to examine grade levels other than 2, 5, and 8, especially the high school grade levels, since no high school levels were examined. This would clarify whether or not the grade levels studied are exceptions or whether they are representative of the CCSS as a whole.

A second area is asking expert, experienced teachers to rate the standards for developmental appropriateness and importance. Expert teachers with years of teaching experience should be reliable judges as to what the correct level of any given standard is and whether or not the CCSS have hit this mark. Additionally, one of the common criticisms of standards in general is that they are bloated, and that consensus is reached by addition. Asking expert, experienced teachers to evaluate the importance of individual standards statements from the CCSS will give an indication of whether this criticism is true of the CCSS.

Further research is needed to determine whether implied skills that are related to information problem-solving must be taught explicitly, the consequence of not stating these explicitly in standards statements, and methods for how these are taught most effectively. A specific question this raises is, to what extent do teachers realize and act to instruct skills that are implied but not explicit in standards statements?

Information literacy is one of the key skills for living and working in the 21st century. The CCSS Initiative is an important education policy initiative affecting education in 45 of the 50 states. The CCSS Initiative in its current form fails to clearly address several areas of the information problem-solving process, and most importantly fails to include Task Definition. To fully address the needs of the nation's students in the 21st century, these faults must be addressed.

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