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Youth and Digital Media:
From Credibility to Information Quality

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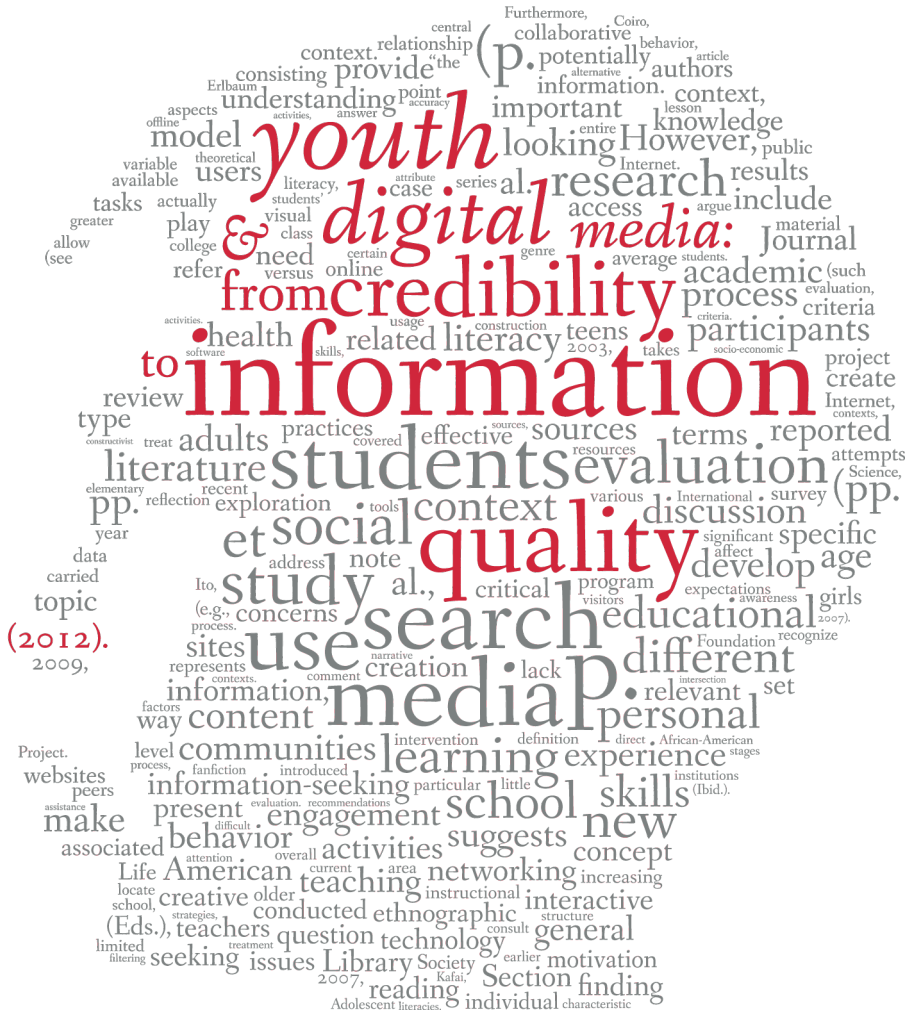

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KEYWORDS

Youth, young people, students, children, adolescents, teenagers, high school, middle school, elementary school, digital media, new media, Internet, ICT, Web, online, information quality, credibility, relevance, reliability, trust, truth, authority, veracity, evaluation, information behavior, information-seeking, information-problem solving, everyday-life information seeking, media literacy, information literacy, digital literacy, new literacies, content creation, blogging, education, learning, teaching, instruction.

ABSTRACT

Building upon a process- and context-oriented information quality framework, this paper seeks to map and explore what we know about the ways in which young users of age 18 and under search for information online, how they evaluate information, and how their related practices of content creation, levels of new literacies, general digital media usage, and social patterns affect these activities. A review of selected literature at the intersection of digital media, youth, and information quality—primarily works from library and information science, sociology, education, and selected ethnographic studies—reveals patterns in youth's information-seeking behavior, but also highlights the importance of contextual and demographic factors both for search and evaluation. Looking at the phenomenon from an information-learning and educational perspective, the literature shows that youth develop competencies for personal goals that sometimes do not transfer to school, and are sometimes not appropriate for school. Thus far, educational initiatives to educate youth about search, evaluation, or creation have depended greatly on the local circumstances for their success or failure.

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Urs Gasser
Principal Investigator

EXECUTIVE SUMMARY

More than 90% of teens and young adults in the U.S. use the Internet (Pew Internet/Lenhart et al., 2011), and similar statistics are reported from many European countries (Ofcom, 2011). The implications of this are profound; a growing body of interdisciplinary research suggests the Internet has become a key medium for young people who have access to digital technology and the basic skills to use it. Various studies also suggest that the Internet shapes many aspects of young people's lives. In light of this growing importance of the Internet, various stakeholders—including parents, teachers, technology providers, policy-makers and, in some instances, young people themselves—have engaged over the past half a decade in a dialog about the risks and opportunities that young internet users experience online. A significant share of stakeholder writing focused on risky behaviors online, including contact risks, cyberbullying, and privacy problems (Pew Internet/Lenhart et al., 2011; boyd & Marwick, 2011; Palfrey, boyd, & Sacco, 2008). Researchers from various disciplines have also concentrated efforts on these issues, providing a growing body of data on these risk categories and related economic, social, and legal practices has become available and can be used to inform the public debate and policy-making.

Other important youth-related policy issues have yet to be explored in greater detail. This highlights one such underexplored topic: *information quality* in the youth and digital media context. This paper is motivated by the observation that the Internet has led to structural changes in the information environment that affect the quality of information (in this paper, we us the term "information" in the semantic and pragmatic sense, i.e. information as "meaning" and "effect"). The increased and more diverse set of "speakers" online, the lack of traditional gatekeepers, the entrance of new intermediaries, the disappearance or replacement of mechanisms and standards aimed at ensuring certain quality levels, media convergence, and context shifts make quality judgments about information in the digital media ecosystem arguably more challenging and corresponding skills even more important. The relative vulnerability of children given their stage of cognitive development and limited life experience increases the relevance of the problem. That being said, the ability to adequately deal with the multi-faceted information quality challenge is not a youth-specific issue that resolves itself once an individual reaches adulthood. Rather, the relevant skills, or the lack thereof, will significantly shape the ability to navigate cyberspace throughout a user's life.

This paper offers a conceptual framework to inform future research initiatives on this topic and serves as a navigation aid to slowly emerging policy debates. Second, the paper reviews a diverse body of literature—including disciplines such as information science, library science, psychology, sociology, anthropology, education, and law—at the intersection of research areas concerning digital media,

youth, and information quality and cluster key findings onto the framework outlined in the first part of the paper.

Our approach is novel in two important respects. First, we suggest expanding the currently dominant theoretical model with its focus on credibility towards a more holistic notion and *framework* of information quality. Second, we suggest a stronger *process-orientation* when exploring information quality issues by looking at the entire process of youth interaction with information, which today includes not only the evaluation of a piece of information, but also the search, creation, and dissemination of information.

In order to be able to draw upon research from various disciplines, a common referent for categorizing studies that might subscribe to different disciplinary norms had to be established as part of our framework. We developed a tentative *taxonomy* with four basic clusters that approach information quality from different perspectives:

- The *ethnographic perspective* defines information quality as that which makes young information seekers choose one piece of information over another.
- The *adult-normative perspective* defines information quality and young users' recognition of it in terms of adult expectations and norms.
- The *systematic perspective* defines information quality through abstract reflection rather than empirical investigation.
- The *prescriptive perspective* defines information quality by how much the datum improves the lives of users, whether young or adult.

Using this taxonomy, we have reviewed studies in English that discuss digital media, youth (which we limit to individuals up to 18 years of age, i.e., legal minors under U.S. law), and information quality, with a primary focus on works from library and information science, sociology, and education, complemented by a review of ethnographic studies and research in the field of "new literacies." The literature has been screened and organized along several interrelated, but not necessarily sequential, phases of youth interaction with information: determining information needs, searching for information, evaluating information, adapting and applying information, creating new information, and disseminating information.

In order to gain a deeper understanding of how youth determine information quality on the Internet, it is important to take into account the *different contexts* in which they engage with information online. For the purpose of this paper, we differentiate among three such contexts:

- The academic context, a set of patterns associated with school and homework;
- The personal context, a set of patterns associated with time alone
- The social context, a set of patterns associated with places and spaces of socializing and peer interaction.

Although it is analytically useful to parse out these contexts, they are in reality not mutually exclusive and may overlap in many cases. Our paper surveys practices in all three contexts, but our ultimate area of interest is the academic context.

The literature review offers an overview of the current state of research on information quality in the youth and digital media context. That being said, the individual findings highlighted in this paper need to be read in the specific methodological context of each scholarly contribution we have reviewed. More often than not, the findings summarized in this literature review are based on small sample sizes and therefore cannot be (over-)generalized. Nonetheless, the numerous studies we have summarized provide at least an early approximation of—and in the case of some recent studies even a proxy for—youths' information quality experience online. With these important caveats in mind, we present the following findings from research, which outline some of the key issues covered in the paper. The findings are roughly clustered into three main categories: search, evaluation, and creation and dissemination.

Our review of literature on *how youth search for information*—particularly in the academic context—reveals a number of interesting insights and issues for further consideration, including the following:

- Several studies suggest that information-seeking activities often span both online and offline media (including human resources), that online and traditional sources do not necessarily present an either/or situation for youth, but that youth might use different information sources for varying purposes.
- Research findings on youths' search behavior reflect the advances in online information retrieval systems over time. One early study found that young users often tried to use keywords to guess at website URLs, but more recent research showed young people ubiquitously using search engines. Studies suggest that youth generally feel positively about their experience with search tools. Nevertheless, research also suggests varying degrees of fluency with the full functionality of search engines.
- Exploratory studies suggest that younger users in particular prefer search results with clear reference to their topic, for instance in terms of keywords, while the context is of secondary importance to them. When searching through websites, younger users pay much attention to

visual elements, including the quality of the graphics and multi-media. Research also suggests that youth prefer sites with large quantities of information.

- Our review of literature has revealed relatively little on how young users search for visual and interactive content, including videos—an area of growing importance with YouTube ranking among the most frequently-used search engines.
- In addition to the importance of search engines, ethnographic studies highlight the importance of "fortuitous searching", a form of search involving browsing from link to link in an undirected manner—particularly where search in the personal context is concerned.
- According to multiple studies, the termination of the search process depends not only on the finding of satisfactory information, but also on factors such as motivation, boredom, time limit, and information overload.
- Information-seeking behavior shapes and is shaped by a set of contextual and demographic variables. Studies suggest that variables include not only the purpose of search, but also gender (boys and girls appear to employ different search and navigation strategies), socio-economic status, networks of friends, and to some extent age, race and ethnicity (for instance regarding information needs). However, many of these variables have not yet been fully explored.
- Key challenges are information overload, distraction, and complexity of information. These are challenges not only recognized by adults as facing youth, but also by youth through vocalizing their frustrations.

The second cluster of literature we reviewed looks at the phenomenon of *information evaluation* by exploring how youth make the decision about whether to use a given piece of information towards the purpose that motivated the search. We surveyed both research examining "relevance judgments" as well as "credibility judgments" and identified some overall patterns. In this thematic context, we interpret quality criteria as aspects of information quality, which deepen our understanding of how youth evaluate information online.

- At a basic level, various studies suggest that topicality is among the first evaluation criteria for youth and adults alike.
- Research suggests that youth use indirect cues and heuristics to judge the quality of websites. One study, for instance, reports that students filter out websites with pornographic content, websites with content and spelling errors, and websites lacking a bibliography. Distrust was also reported for .com sites, with a preference for *.gov* and *.edu* sites. A proposed theory about youth heuristics associated with digital media leads to a list of quality criteria that includes utility, importance, relevance, believability, popularity, etc.

- Perhaps the most important cue for youth—both in the search context as well as with respect to the evaluation of sites—is that of visual and interactive elements, as a number of studies indicate. Importantly, there is also some evidence that youth do see graphics and multimedia not just as indicators of overall quality, but also as information objects which are open to quality judgments.
- As in the search context, evaluation depends on a number of variables. Studies suggest that evaluation patterns are primarily shaped by the purpose and motivation of a search, with academic purpose and personal or social purpose as the two main values of the variable.
- Research suggests that gender affects evaluation. One study, for instance, suggests that male high school students seem to evaluate the credibility of websites more positively than their female peers do. Another study suggests that participants with high feminine-normative characteristics place more importance on the quantity and quality of visual designs than their female peers with high masculine-normative characteristics do.
- Social and cognitive development, which is usually a function of age, is among the most important variables shaping the ways in which youth perform evaluations. For instance, studies indicate that users' ability to articulate quality criteria, for instance, differs among different age groups. Another study suggests that the skepticism about certain types of information found on the Internet (e.g. health information) decreases, as youth gets older. Though further research is warranted, some studies document the influence of socio-economic status on evaluation as well as the relevance of variables such as race and ethnicity, peer influence, and individual preferences.
- Problems in this area are mostly concerns adults have for youth, especially that youth do not evaluate quality according to the established adult-normative criteria emphasizing credibility, accuracy, and authority. Another concern is that youth do not distinguish sufficiently between commercial and non-commercial content.

The third cluster of literature considered in this paper concerns youths' *information creation and dissemination* practices. Youths' creative activities are an important dimension of their interaction with information, which in turn can be expected to shape how they search for and evaluate information. Some of the key considerations include:

- A review of creative content categories such as social networking services, wikis, personal websites, blogs, self-authored content sharing, games, etc., suggests that a significant share of content creation happens within the personal and social contexts of a young person's life.
- Research shows that youth may acquire a number of skills as they create and disseminate content on the Internet. Broadly speaking, such practices allow youth to develop better skills in

navigating the information environment and making judgments about the quality of information. In addition to the acquisition of digital fluency and technical skills, a growing body of literature further suggests that online spaces help youth develop language and writing skills, as well as social and collaborative skills.

- Norms exists for youth's information creation and dissemination activities. Such norms—which often take the form of expectations and behavior patterns —include peer-based reciprocity, practices and codes of conduct around "beta-reading," feedback and editing, and interest-directed practice.
- Though content creation and dissemination practices from the personal and social contexts are significant for the academic context because they relate to information quality issues, the practices and norms that youth form around their content creation activities in the personal/social context may frequently clash with classroom norms and expectations. This complicates hopes of straightforward "skill transfer," but leaves open the possibility that engagement with the entire culture of content creation and dissemination can bring skills into the classroom context in a way that a decontextualized approach to and understanding of youth skills may fail to do.

The fourth and last cluster of literature surveyed in the paper explores *how youth acquire behaviors* concerning search, evaluation, and creation of information. This section of the paper departs from traditional literature review conventions and adopts a discussion format in order to put the mostly small-scale intervention studies in dialog with the literature reviewed in the previous sections and the information quality framework developed in the first part of the paper. High-level insights gained from the engagement with selected literature include the following, including the identification of knowledge gaps:

- Youth acquire search, evaluation, and creation behaviors in personal, social and academic contexts. Ethnographic studies demonstrate that youth learn from engaging with games, creative activities, and virtual communities in personal and social contexts. These shape young users' social experience of the Internet as well as their notions of information quality.
- There is relatively little work examining how learning around search and evaluation works in the personal context. One ethnographic study points to the importance of learning through trial and error and piecewise exploration, such as by refining search query terms after getting confused by initial research and by cross-referencing offline and online information.
- In the course of our review, we have not been able to identify research examining parents' roles in the development of youths' search and evaluation skills. Previous research demonstrates the impact of parental guidance on children's literacy; it would be interesting to explore whether

this translates into the digital media space with phenomena such as fan fiction writing and information exchanges on social networking and online messaging sites.

- Several examples from ethnographic research suggest that virtual communities create norms for technology use and participation, which in turn shape young users' social experience of the Internet and their ideas about information quality.
- Studies suggest that the learning associated with information creation blends the personal and social contexts more than does the learning associated with information seeking and evaluating. Also, research suggests that the communities that form around digital media creation are not invariably mediated through digital media themselves. Settings such as clubhouses, after-school programs, and community centers provide opportunities for access and peer-based learning.
- In addition to studies examining how youth learn outside of school, academic literature also documents a series of school-based interventions aimed at improving youths' search, evaluation, and creation behavior. Research in this context is largely prescriptive, testing or seeking to improve youth behavior according to adult-normative standards, and pertains to media education and educational technology.
- Our review suggests that the majority of interventions regarding information quality tend to focus on carrying out the search process and aim to help students at this stage, for instance by providing specific tools for narrowing the search space or teaching students a specific process model for searching. Alternative approaches such as "minimalist instruction" or teaching "self-regulatory skills" also exist. The experiences with these interventions vary greatly. The timeframe for instruction and the degree of teacher involvement are important variables, some investigators think more important than the content of the actual intervention.
- Classroom interventions that focus on search often convey implicit prescriptions for evaluation. Much research, however, focuses on evaluation outside of the search process. One common, but frequently criticized, approach to teaching website evaluation is to prescribe a fixed set of evaluative criteria (i.e. a checklist). Alternative approaches include fostering critical thinking and teaching through games.
- Educational programs have emerged with the goal to teach creation and teach through creation. The Computer Clubhouse Network is likely the largest and best-documented educational initiative structured around information creation. Ethnographic studies also document efforts in other after-school programs and learning environments. Several studies discuss the (still limited) experiences with blogging, wikis, social networking, and the creation of video games in the academic context.

The research map on youth, digital media, and information quality offered in this paper sets the stage for at least two important conversations. First, it highlights specific focus areas and research questions that are currently underexplored, including

- How increased levels of creative interaction with information shape users' ideas of information quality and how they influence search and evaluation behavior.
- How different variables, including socio-economic status, gender, development and experience, and peer influences, affect the search, evaluation, and creation practices of youth.
- How to leverage youth content creation and dissemination activities effectively from the personal and social contexts for the academic context, and how to resolve the conflicts of expectations and norms between these two contexts.
- How to consistently, and systematically test educational interventions that teach young people how to search and evaluate search results. An effective testing method could be used on existing educational interventions and to develop new ones.

Perhaps even more important than the new questions the current state of research suggests is the mandate for a public *policy discussion* on youth, digital media, and information quality issues. As young people rely increasingly on the Internet as a source for information, a research-based policy is imperative.

For example, this paper reviews a body of literature on how young people access health information on the Internet. As youth turn to online sources for critical decisions about health, educators and policy-makers must be wary of the risks arising from information quality issues and seize the opportunity to design accessible online sources that account for youths' search, evaluation, and dissemination behaviors.

Educational interventions seeking to increase youth facility with navigating online information stand to benefit from the information quality framework, as the search, evaluation and creation process will increasingly come to bear on the modern information economy. As more careers demand immersion in digital technologies, education and job training must adapt to the new information ecosystem. As civic engagement, cultural participation and employment increasingly demand immersion in digital technologies, education must adapt to the new information ecosystem, especially to ensure that inequalities in support structures and access do not further deprive disadvantaged populations of opportunities for advancement.

We wrote this paper to initiate this policy discussion by distilling important findings in the literature and highlighting areas of future research. We have defined an information quality framework that emphasizes the imperative of involving in this policy discussion the participation of all stakeholders, including policy-makers, technology developers, educators, parents, and youth.

TABLE OF CONTENTS

1. INFORMATION QUALITY AND YOUTH – A RESEARCH FRAMEWORK

1.1 Information Quality

Digital technology in tandem with the emergence of computer networks has fundamentally changed the ways in which information, knowledge, and entertainment are created, distributed, accessed, and (re-)used (see, e.g., Benkler, 2006). These shifts have led to an unprecedented amount of information available online and to a qualitative change in the information ecosystem. The digital media ecosystem offers a different and richer set of issues to consider when exploring information quality than the old analog systems of distributing information, such as book and journal publishing and broadcast media. Many factors make quality judgments about information more challenging. Traditional gatekeepers, such as editorial boards, whose task it was to guarantee certain levels of quality in the analog environment, are less important in the online world. Intermediaries such as search engines and information aggregators do not fill the precise role of old gatekeepers, and there are a limited number of standards for quality control and evaluation (see, e.g., Flanagin & Metzger, 2008, pp. 12-14; Hargittai, 2008a).

At the same time, data suggests that the Internet has become one of the most important information sources for young people who have access to digital technology and the basic skills to use it. Surveys further indicate that online information plays a significant role in decision-making, including decisions in important areas of life such as health, education, and financial matters (Pew Internet/Lenhart, Madden, & Hitlin, 2005). These observations highlight the relevance of the question of information quality, both from a quantitative and qualitative perspective and viewed from the angle of individuals and society at large. Against this backdrop, a new strand of loosely coordinated research is emerging that explores—under different headers and with different agendas—the question of *quality*. Policy-oriented research clusters include studies looking at supply-side issues, for instance dealing with what we may describe as "minimum quality" and focusing on types of content that are considered to be inappropriate or even harmful in a particular cultural or societal context. Other efforts highlight quality issues associated with new types of intermediaries; research on the quality of search and search engines is an example of this category. A third strand of research looks into various demand-side issues, including the new skills that are required to make quality assessments in the digital environment.

Across these heterogeneous debates, researchers from various disciplines are asking how *young users* navigate—or in the view of their parents and teachers, *should* navigate—the increasingly diverse information ecosystem with its various quality levels and spectrums. Researchers focus on young users because the Internet is a critically important information source for them, and because they perceive

the relative vulnerability of youth in general and children in particular, which has to do with their cognitive development, limited life experience, and other characteristics that shape—and arguably often limit—their ability to make sound judgments about the quality of information (see, e.g., Palfrey & Gasser, 2008, pp. 155-183). Much of the work focusing on youth has concentrated on credibility as one particularly important aspect of information quality.

In Sections 4-7 of this paper, we seek to review the diverse and growing body of literature at the intersection of the research areas concerning digital media, youth, and information quality based on a *conceptual framework* that might inform not only future research efforts, but also policy debates in this thematic zone. Reviewing literature from disciplines as diverse as library and information science, psychology (human-computer interaction), sociology, anthropology (ethnography), new literacies, education, and law has been an iterative process, culminating in two novel proposals: First, we suggest expanding the currently dominant theoretical model with its focus on credibility (as one important quality criterion) towards a more holistic notion (and framework) of information quality. Second, we suggest a stronger process-orientation when exploring the information quality phenomenon by looking at the entire process of youth interaction with information, which in the digital ecosystem not only includes the evaluation of a piece of information, but also the search, creation, and dissemination of information.

1.1.1 From Credibility to Information Quality

Our previous research efforts (Gasser, 2000, 2002, 2004) have led us to the conclusion that the tectonic shifts in the information ecosystem as outlined above call for a shift from the dominant theoretical perspective that focuses on the credibility of information to a broader framework of information quality. We formulate information quality differently than the established concept of credibility in two ways. First, we see the entire context in which assessments are made as significant. As Hargittai, Fullerton, Menchen-Trevino, and Thomas (2010) have recently argued with regard to adults, search context is a "crucial part of the puzzle of online credibility assessment," yet consideration of search context has been "heretofore largely absent in [credibility] literature" (p. 469). They have independently begun moving towards studying "the important role that search context plays in what content many users deem trustworthy," and encouraging credibility literature as a whole to follow. Pairing studies of scaffolded search behavior, such as those of information seeking and information problem-solving (IPS), with those of evaluation practices advances a conception of information quality centered on both process and context.

Second, we recognize that the study of how Web users make judgments regarding the quality, or credibility, of information is conditioned not only by context of those evaluating information, but by

the research context as well. Researchers that view credibility as a desirable criterion for evaluating information may import the concept to the study of youth, or any demographic for that matter, even if that group's notions do not correspond to the researchers' notion of credibility. One illustrative example involves Eastin (2008), who notes that children's consideration of cues to determine credibility, such as "an author's use of dynamic content such as pictures and animation," fall short of "accurate credibility assessments" (p. 39). Similarly, Flanagin and Metzger's landmark study finds that youth younger than eleven years old were not able to grasp the researchers' concept of credibility well enough to participate in the study (Flanagin & Metzger, 2010). Credibility researchers, in sum, may formulate the concept differently from youth as well as from each other. Moreover, while several strands of credibility research conceive of credibility in relation to information quality, such relations are by and large neither uniform nor well defined.

One strand of empirical studies of youth evaluation frequently leaves "quality" undefined (Lorenzen, 2001, p. 159; Agosto, 2003a, p. 22; 2003b, p. 327; Hoffman, Wu, Krajcik, & Soloway, 2003, p. 326; Heinström, 2006; Shenton, 2007, p. 4; Gerjets, Kammerer, & Werner, 2010). Often, it is used as an alliterative contrast to "quantity" (Agosto, 2002b, p. 327; Roy, Taylor, & Chi, 2003, p. 231; Shenton & Dixon, 2004, p. 188; Kuiper, Volman & Terwel, 2008, p. 684). When it is explained, it is often presented as one of many evaluation criteria, including credibility, source, accuracy, authority, actuality, and validity, among others, though without consistent or comprehensive definitions. In developing our literature review methods, we came to call this group of studies *adult-normative*, which we explain further in Section 1.5.

Similarly, another strand of literature ties information quality to credibility, relevance, reliability, accuracy, truthfulness, or actuality, yet often identifies information quality as an "objective" component of a larger analysis. For example, Metzger (2007) considers "judgments about information quality or accuracy" to be the "objective" part of credibility judgments. Fogg and Tseng (1999, p. 83) point out that educators and educational institutions, among others, have framed efforts to teach people to avoid making mistakes in credibility judgments with the heading of "information quality." The above authors, and others, constitute a research strand of credibility studies we name *systematic*, explained in Part I.5.

Yet another strand of literature formulates a connection between quality and objectivity, albeit more prescriptively. In a study of students from grades eight to twelve, Jacobson and Ignacio (1997) suggest using the term "quality" to refer to universally agreeable standards (such as not having dead links) as opposed to the relative usefulness of information. From a relativistic perspective, they recognize that "information is only as good as the degree to which it meets a particular need at a particular time";

nonetheless, they see a need for describing in non-relative terms their students' "lack of a quality filtering mechanism" online for sorting through dead links. This position characterizes the norms and motivations of the *prescriptive* strand of credibility literature, explained below.

In addition to relating quality to credibility and other evaluative criteria, credibility researchers have also tried to quantify quality. Though their research is not specific to youth, Cho and Roy (2004) define a "quality function": the quality of page *p*, Q(p), as "the probability that an average user will like the page *p* when she visits *p*" (p. 23). Here we see quality quantified as a relative and probabilistic measure. Additionally, Roy, Taylor, and Chi (2003), introduce a quantitative measure of the quality of information browsed by students. This measure involves tallying the total number of students' correct "target" ideas (information for the given task, which was to find out how mosquitoes find their prey) and correct "incidental learning" ideas (related information, such as why mosquito bites are itchy). Notably, the authors' effort to produce a quantitative measurement of quality comes after originally addressing quality in contrast to quantity (p. 232, p. 244).

In a significant step towards the framework we propose, Rieh (2002) and Hilligoss and Rieh (2008) view credibility within a broader framework of information quality. Hilligoss and Rieh (2008) define information quality as "people's subjective judgment of *goodness and usefulness of information* in certain information use settings with respect to their own expectations of information or in regard to other information available [emphasis original]." The believability of information is but one of the questions asked in determining quality, thus rendering credibility "a *chief aspect of information quality* [emphasis original]." For Hilligoss and Rieh, much as for us, credibility becomes an important component—yet ultimately, just one component—of the broader framework of information quality, contingent on the fluid process of search and evaluation as well as the context of the information users.

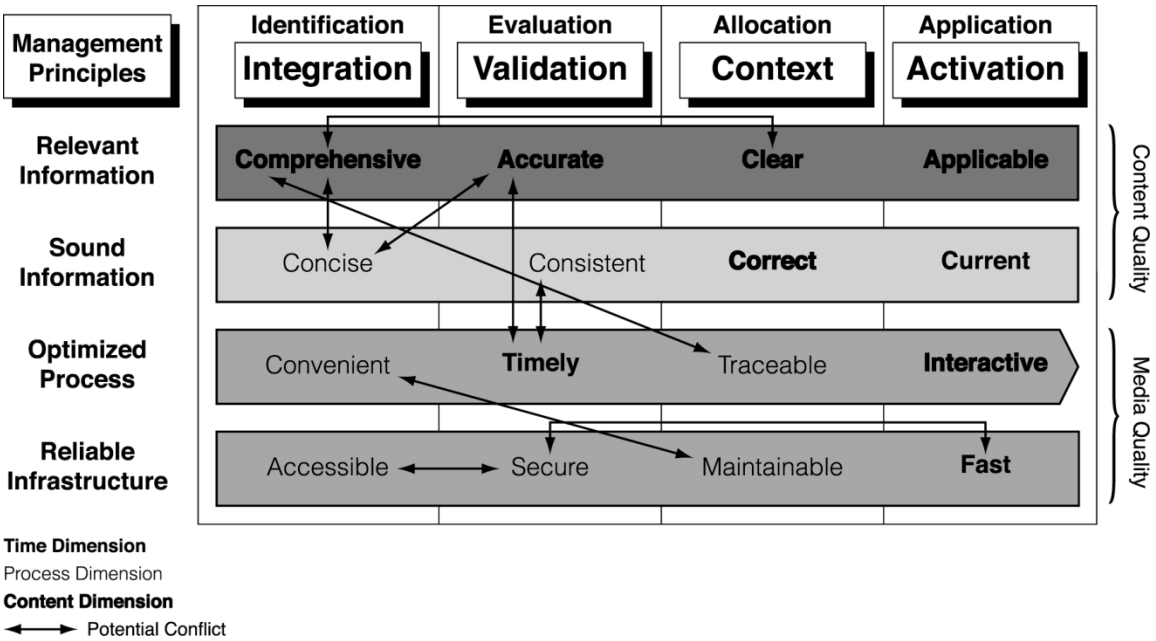
1.1.2 Towards a Context- and Process-Oriented Framework

As noted, the second conceptual extension to the credibility paradigm builds upon the earlier work of one of the authors of this paper (Gasser, 2000, 2002, 2004) and highlights the need to move beyond criteria such as credibility, timeliness, etc. towards a more holistic framework that takes into account the complexity of information phenomena. Perhaps surprisingly, management literature has proven to be useful in organizing different strands of social science literature into a new framing of *quality*. The development of the concept of information quality in the management context has been driven by the practical considerations of the needs of businesses and institutions to manage data and information. As such, the concept has been subjected to selective pressure, and what has emerged is a framework that considers and systematizes all aspects of the process of determining information needs, finding information, evaluating information, and adapting or applying information.

Management literature's earliest treatments of information quality enumerated criteria for what makes information high quality. Subsequent treatments (Wang, 1998) advanced the discussion to examine what exactly information quality means, not just as a sum of a list of criteria, but rather, as a concept. Wang, the MIT Information Quality Project, and the MIT Total Data Quality Management Program advanced the model of information quality as "fitness for use." This notion, critically, emphasizes the primacy of context fitness for use is determined relative to "usage" needs. Such a context-centered notion of information quality seems to conflict with the intuitive meaning of the term information quality. At face value, the phrase suggests that information has quality, i.e., that quality is an intrinsic property of information objects. If we think of information quality as relative (as with fitness for use) we find ourselves in the counterintuitive position of being unable to talk properly about whether a given piece of information, in isolation, is high or low quality. Since quality is defined relative to the context and needs of whoever perceives the information object, the exact same information object may be high quality for one person and low quality for another. While such a relativistic notion marks an advance in thinking on the subject, it nonetheless merits explanation that the concept differs from the intuitive meaning of the term (Gasser, 2002, pp. 737-741).

Building upon this strand of research, Eppler (2003) has established a comprehensive framework that emphasizes both context and process in an integrated information quality model. The framework, illustrated below, has two axes: levels and principles. Levels refer to the sites and situations in which information is located. Principles, for Eppler, "[suggest] a way of reasoning or acting that is effective and proven to reach a certain goal within an organizational context" (p. 79). The first axis consists of four levels: relevance (to a community dealing with information), soundness (of an information product), process, and infrastructure (60-61). The community and product levels refer to quality of content, while the process and infrastructure levels refer to the quality of media (p. 161). The axis of principles consists of the four management principles of integration, validation, context, and activation, following a chronological progression of how information is processed. Together, the two axes situate Eppler's sixteen criteria for high quality information, viewable below.

Table 1
The Information Quality Framework.



Note. From *Managing Information Quality: Increasing the Value of Information in Knowledge-intensive Products and Processes* (p. 61), by M. Eppler, 2003, Berlin: Springer-Verlag. Copyright 2003 Springer-Verlag.

Overall, Eppler (2003) emphasizes quality as a *relative* property. He also provides a working definition of information quality as "the characteristics of information to meet the functional, technical, cognitive, and aesthetic requirements of information producers, administrators, consumers, and experts" (p. 45).[1]

Academic researchers have considered many of the issues summarized by this holistic framework of information quality under terms such as "relevance" and "credibility," but only rarely have they considered the process as a comprehensive whole. For youth in digital contexts, the entire process of interaction with information—including search, evaluation, creation, and dissemination—matters in a way it perhaps did not matter before. Management literature provides us with a fully developed way to think about the entire process. While we recognize that management models are not entirely appropriate for our needs, their systematic concept of information quality has great relevance to social science. There has been considerable fruitful cross-disciplinary comparison and awareness on the topic of credibility (Flanagin & Metzger, 2008, p. 8; Fogg & Tseng, 1999), and all disciplines and institutions would benefit from cross-pollination on broader issues of information.

1.2 Youth Context

The information quality framework outlined in the previous section highlights the importance of context. Based on this framework, we seek to map and survey the current state of research on digital media and youth. In order to do this we will clarify what we mean by "youth" and our understanding of the term "information" and look more closely at some of the typical contexts where young people engage with digital media and where information quality comes into play.

1.2.1 Definition of "Youth"

Social scientists use a variety of terms to refer to youth, such as: youth, young people, minors, children, younger children and older children, prepubescent children, prepubescent youth, preadolescents, adolescents, teens, teenagers, younger teenagers and older teenagers, and older youth. A review of the literature suggests there is as of yet no real standard for using or defining these terms. Furthermore, Ito et al. (2010) note that it is difficult to use age-graded categories in a rigorously ethnographic sense because youth often do not use age-graded categories to describe themselves, though they concede that "we frequently must impose categories" (pp. 7-8) to pursue our goals as academics, policymakers, educators, and advocates of youth. As a partial attempt to avoid such categories, we adopt the convention of referring to all legal minors (generally, individuals under the age of eighteen in U.S. law) as "youth." We choose to follow the institutional category of minors because, even if it is a social and legal construct, its social and legal effects fundamentally define and shape social experience. Apart from this convention, we will only use age-graded categories when quoting or paraphrasing a source that uses them, and in such cases we will make clear how the source defines the chosen terms. For the sake of variation, we also will often use students or participants when appropriate.

Collapsing the multiplicity of age-graded categories is appropriate in this literature review because we are able to capture the multiplicity of experience and behavior in finer detail by specifying, for each study we present, the specific ages of the participants and all demographic information given in the study. While this still erases individual and demographic variation that may be more important than age (for example, youth who read "below grade level" are labeled as such because their abilities and competencies are considered in some sense equivalent to younger students), studies do not typically include such detailed information about participants. Some studies discuss subjects not in terms of age but in terms of the system of numbered school grades used in the U.S. grades and age are not exactly equivalent; students can start schooling a year early or a year late, and students can skip grades or be held back grades. To help readers convert between age and grade, we provide the following chart for reference:

Table 2

K-12 Grades And Approximate Corresponding Ages In U.S. Education

EDUCATIONAL LEVEL	SCHOOL TYPE	GRADE	AGE (APPROX.)
Primary Education	Elementary School	Kindergarten	5-6
		1	6-7
		2	7-8
		3	8-9
		4	9-10
		5	10-11
Secondary Education	Middle (Junior High) School	6	11-12
		7	12-13
		8	13-14
	High School	9	14-15
		10	15-16
		11	16-17
		12	17-18
Post-secondary (Tertiary) Education	College/Undergraduate[2]	Freshman	18-19
		Sophomore	19-20
		Junior	20-21
		Senior	21-22
	Graduate or Professional School[3]	(Varies)	22+

Primary and secondary education are compulsory, and are referred to collectively as "K-12 [K through 12] education;" after this, ages typically become more variable.

1.2.2 Youth Definition of "Information"

Shenton, Nesset and Hayter (2008), in one of the few studies on youth understanding of the word "information," write that despite information being a buzz word of the 21st century, and despite many studies looking into use of information technologies and behavior around information, "very few have explored what individuals think the term 'information' actually means" (p. 151). They quote earlier graduate work by Shenton showing that "children as young as five and six years of age have already constructed limited mental models of the notion of 'information'." The authors recognize this lacuna may express most researchers' general preference for more obviously relevant work about information needs and information-seeking behavior over the relatively esoteric investigation of the abstract concept of information. They argue, "If users develop different understandings of the information they encounter, it may be forecast that their comprehensions of the term itself will exhibit comparable

variation" (p. 152). They also note that to maintain clarity of communication, those who teach youth about information need to have insight into how youth understand the concept.

Therefore, Shenton et al. (2008) explored the issue as part of a larger study carried out among 45 third-graders, ages eight to ten, and of varying academic ability.[4] From the responses, they developed a coding of seven distinct strands of understanding among the youth participants: the "need-centred strand," where information is that which is needed; the "action-process strand," where information was that for which action was needed to access; the "form-oriented strand," where information is writing (or, in a more sophisticated interpretation, information is that which is represented by writing); the related "linguistic structure strand," where information is that which consists of words, especially a great volume of words or words joined as sentences; the "source-driven strand," where information is that which is obtained from particular resources or tools (including papers, the computer, or books); the "content-based strand" (most respondents), where information is that which is *about* something (which the authors note is an impressive generalization, if not an abstraction); and the "use-related strand", where information is that which helps or enables one do something, such as a project (pp. 153-155). Shenton et al. also note that the participants frequently used the word "stuff" as a synonym for information when trying to describe information (pp. 153-155), a finding that they note is consistent with previous work (p. 158).

While this is not sufficient to make conclusions about how all youth conceive of information (or even of how all youth aged eight to ten conceive of information), we can conclude that it is ethnographically appropriate to not attempt a precise analytical definition of information and to allow variation in understanding of information. Thus, we fold various understandings of the word "information" into the flexibility of the information quality framework. That being said, this paper focuses on information in its semantic and pragmatic interpretation, i.e. as "meaning" and "effect".

1.3 Context and Purposes

In order to understand how young Web users determine information quality we need to map the contexts in which they engage with information online. We identify three contexts—personal, social, and academic—based primarily on patterns of activities, behavior, thoughts, feelings, motivations, information needs, identities, and performances associated with certain times or physical sites of interaction with the Web.

- The academic context is the set of patterns associated with the place of school, thus including schoolwork done at home;
- The personal context is the set of patterns associated with time alone;

- The social context is the set of patterns associated with places and spaces of socializing and peer interaction, including school and virtual spaces.

Our tripartite classification of contexts is based on two types of approaches to understanding youth behavior: adult-normative understandings of youth information needs (Agosto & Hughes-Hassell, 2006b, p. 1425), which study youth behavior from a perspective that gives primacy to adult norms and motivations, and ethnographic ideas of *genres of participation* (Ito et al., 2010, p. 36), which attempt to make sense of youth behavior online from youths' own perspectives. The academic, personal and social contexts consist of information needs. They also constitute genres of participation in terms of being overall "packages" of youth communication and culture (Ito et al., 2010, pp. 36-37). However, our classification of the three contexts is ultimately grounded in educational concerns, not actors' categories that youth themselves articulate.

Still, our three contexts are heavily informed by Ito et al.'s (2010) three genres of participation: "hanging out," "messing around," and "geeking out." Hanging out is friendship-driven practice, geeking out is interest-driven practice, and messing around is a bridge between the two (pp. 75-76). More specifically, hanging out references youth occupying spaces they construct through digital media, spaces "for copresence where they can engage in ongoing, lightweight social contact that moves fluidly between online and offline content" (p. 38). Hanging out, then, aligns with what we term the social context. Messing around is the beginning of more intense engagement with online content or creative activities, online or offline (p. 54). While messing around is not always a solitary activity, much of the exploration happens in isolation, and thus corresponds fairly well to what we categorize as the personal context. Geeking out is characterized by intense commitments involving both social connections and personal development (p. 66). This genre of participation does not correspond to any one of our categories but maps to both the social and the personal contexts.

Ito et al. (2010) identify their approach as being "ecological rather than categorical," which they argue has the advantage of allowing for flexible media identities "independent of contexts and situations," and shifting attention to patterns of media content, technology design, and cultural referents that cut across media platforms (p. 37). They offer an alternative to taxonomies of media engagement based on "type of media platform, frequency of media use, or structural categories such as gender, age, or socioeconomic status" (p. 36), and they therefore do not make youth practice or experience central. Unlike pure genres of participation, which represent "different investments that youth make in particular forms of sociability and differing forms of identification with media genres" (p. 18), our three contexts—the personal, social, and academic—are not oriented around or characterized by such investments.

Our classification admittedly risks creating a binary between in-school and out-of-school practices. Bulfin and North (2007) critique such a binary, maintaining that youth behaviors in the home and in the school have a "dynamic and constitutive relationship," and that behaviors between the two are "perhaps even one and the same" (p. 249). We agree with the notion of a dynamic and constitutive relationship, and certainly agree that engagement with digital culture does not belong to separate domains. Nonetheless, youth do have different media identities in different contexts and situations (Ito et al., 2010, p. 37) and perform and develop different identities in school, at home, among friends, and alone by themselves. Different contexts and situations, in short, provide a range of experiences with digital technologies (Bulfin & North, 2007, p. 249).

1.4 Skills and Norms

1.4.1 Skills

Given the diversity of literature reviewed in this paper, we do not impose a single definition for skill. However, we recognize that giving attention to skill is useful to understanding youths' experience of information quality, especially as different skills come to bear on the search, evaluation, and creation process. Therefore, the following section puts various treatments of skill in dialog with each other.

Generalizations about youths' universal facility with digital technology misrepresent skill differentials among youth (Hargittai, 2010). Even among those with equal access to the Internet, there are variations in skill, which cannot be explained merely by years of experience or time spent online (Van Deursen, 2010). As it relates to online behavior, skill is difficult to define; it is both a predictor of online behavior and predicted by other characteristics of the user, namely socioeconomic status, gender, education, race, etc. (Hargittai, 2010; Hargittai & Hinnant, 2008). With regard to educational objectives, skill can be both an input, whereby students enter into education with varying skill sets, and a desired output, whereby students gain new skills through education. This education can occur in a formal setting, where adults decide which skills should be learned skills, or in an informal setting, where young people's personal and social goals determine what skills they should try to acquire. Some skills can even be employed to subvert adult expectations, such as the example of "work-arounds" (Horst et al., 2010). This multiplicity of definitions for skill requires that it be considered in context. In Sections 4-6 of this paper, skill will be considered as a variable that modulates youths' behavior in the search, evaluation, and creation process. In Section 7, skill is a product developed and transferred through practice and learning. In the formal education context, skill is defined according to adult-normative and prescriptive ideas about what youth ought to know how to do. In the informal context, skill is often transferred through peer learning, such as the techne-mentor and -mentee relationship (Finn, 2009).

Although this paper does not undertake the task of strictly defining "skill," it is worth referring to a useful framework for thinking about different types of Internet skills. Van Deursen (2010, pp. 58-70) categorizes skills into those that are medium-related and those that are content-related. Medium-related Internet skills refer to how a user relates to the mechanics of operating a Web browser, downloading information, using a search engine, navigating Web page features and menus, etc. Content-related Internet skills relate to search and evaluation of the information content on the Internet, such as choosing search queries, selecting search results, evaluating sources, and choosing an information item.

This distinction between medium-related Internet skills and content-related Internet skills is important because strength in one category does not necessarily predict strength in the other. For example, Van Deursen (2010) observes that the Dutch adult subjects in his study demonstrated greater operational skill than information skill, such as, "defining proper search queries and selecting relevant search results" (p. 146). Van Deursen argues that content-related skills are even more important than medium-related skills; external assistance can compensate for operational skill deficiencies, whereas deficiency in information skill demands more comprehensive learning (p. 145).

Because Internet skill is difficult to define, it is also difficult to measure. Whereas Van Deursen (2010) measures Internet skill through observation of subjects completing Internet tasks in an experimental setting, Flanagin and Metzger (2010) survey individuals on their self-assessment of skill. While the self-rating method can have the flaw of over- and under-estimation of one's own skill (Merritt, Smith, & Di Renzo, 2005; Hargittai & Shafer, 2006; Hargittai, 2005, 2008c) it can also avoid some normative biases about what constitutes skill. Moreover, measuring an individual's skill self-assessment can offer insight into how that individual makes use of the Internet. For example, although men and women have been found to possess equal levels of Internet skill in objective measures, women's underestimated skill self-assessment affects the extent of their Internet use and their online behavior (Hargittai & Shafer 2006). In their survey of 2,747 youth ages eleven to eighteen, Flanagin and Metzger (2010) find that skill self-assessment of girls and boys changes dynamically as they age. For example, boys fifteen years old and older have higher self-assessments of skill than girls that age. However, at younger ages, boys and girls report negligible differences in skill self-assessment. In fact, at age thirteen girls report higher skill self-assessments than boys (p. 28). These data points suggest that youths' Internet skill self-assessment is associated with gender norms and development. Therefore, although self-perceived skill and actual skill may not be equal (Hargittai, 2005, 2009), skill self-assessments nevertheless have implications for educators working with youth.

1.4.2 Crossover Between Contexts

Although we are ultimately invested in insights for the academic context, we examine how habits and skills acquired in the social and personal contexts may likely carry over to academic activity. Taking account of the personal and social contexts may illuminate how youth evaluate quality in their favorite contexts and how they go about increasing the quality of found information or finding higher-quality information, which are activities potentially transferable to schoolwork. Examples include skilled youth with the ability to circumvent controls and create their own environments, as well as the ability to grow their skills through collaboration with similarly skilled youth (Lankes, 2008, pp. 111-112). Notably, such transference can be positive or negative. Positive transference could involve youth who employ sophisticated methods in personal or social information usage (like the collaboration mentioned above, or getting advice and guidance on forums) applying such methods to the classroom. Negative transference might involve casual habits from social information usage (for example, communicating with shorthand spellings and emoticons) crossing over into academic work.

We draw on Ito et al. (2010) to modulate our notion of "skill transfer." Ito et al. critique the term as locating "[the mechanism] in a process of individual internalization of content or skills...it is not that kids transfer new media skills or social skills to different domains, but rather they begin to identify with and participate in different social networks and sets of cultural referents through certain transitional social and cultural mechanisms" (p.18). We explore instances of such crossover in later sections, particularly in those on creation and the academic context. For the purposes of our framework, though, we affirm the importance of making sense of how youth use information in the personal, social, and academic contexts, in relation to each other, although we reject the notion of direct one-to-one transference. Pedagogy will ultimately benefit from a deeper understanding of youths' personal and social information usage, be it for understanding the origin of undesirable habits or trying to appropriate information savvy for academic work.

There are some points where the quality concerns of youth and the quality concerns of adults (including teachers, parents, researchers, etc.) for youth overlap, as the case of searching and evaluating for health information in the personal context demonstrates. Young users are as concerned as adults about the quality of the health information they find online (Kaiser Family Foundation/Rideout, 2001), implicitly understanding the dangers of low quality health information. Also in the personal and social contexts, both youth and adults care about safety and privacy and reputation. However, these are nuanced issues, which adults and youth conceive of and care about in different ways.

1.5 Perspectives on "Information Quality" in the Youth Context

This paper draws on research from several disciplines. As such, it is useful to establish a common referent for comparing studies that may subscribe to different disciplinary norms. Any research project

considers its object of study from a point of view, referred to here as a *perspective*. In this case, the object of study is information quality as it relates to youth. The literature reviewed herein can be categorized according to the perspective it takes with respect to defining youth's experience of information quality. The following taxonomy is by no means absolute or hierarchical, but it provides useful insight into the assumptions involved in any research on youth and information quality.

- Ethnographic perspective: Researchers with this perspective view information quality as that which makes an information-seeking youth choose one piece of information over another. Hence, even if "information quality" is not explicitly an actors' category used by youth in conversations or reflections, we may use it as a generalized term to correspond to implicit preferences, whatever the actors' categories might be. Insofar as youth choose or reject information in every information-seeking process, this definition ensures that there will always be a quality judgment to examine. For example, if we were to have a case where a particularly uninterested youth selected the first (only tangentially relevant) website he came across in doing research for a school project, we would not say that this student does not judge quality, but rather that his notion of what constitutes "information quality" relies mainly on the information having the quality of convenience. Whether or not this is a legitimate conception of quality is not a meaningful question within an ethnographic perspective. This perspective is an interpretation of, and informed by, the ethnographies we draw upon.
- Adult-normative perspective: Under this perspective, information quality is defined by what makes information valuable for adults. We introduce this category primarily to classify literature that makes claims about youth behavior and information quality relative to adult expectations and norms. Such assertions implicitly subordinate youths' own evaluations of information quality. Nonetheless, this perspective is extremely important because we often focus on issues such as accuracy or reliability, even if young people may not have a conception of them, as we ultimately want youth to develop and use such concepts. After all, part of all pedagogy is the effort to expand or improve youths' knowledge base from a starting point toward a goal established by adults.
- Systematic perspective: Researchers writing from this perspective define information quality through abstract reflection rather than empirical investigation. They reflect on the information itself, or on the ways users can think about, mobilize, and utilize information. For example, we would label scholarly attempts to classify different types of credibility (see Section 5) as instances of a systematic perspective of information quality (viewing credibility as corresponding to information quality).

- Prescriptive perspective: Researchers writing from this perspective define quality information as that information which improves the lives of users. Thus, we interpret any literature claiming that its particular understanding of information will improve our lives as taking a prescriptive perspective of information quality. A prescriptive conception of information quality may be applied to both young and adults users. The management literature we draw upon is devoted to prescriptive recommendations of how adult managers should think about information quality.

Within a completely relativistic notion of information quality, all of these perspectives we have identified are simultaneously legitimate and meaningful. The difference between them is the varying perspectives of multiple actors, including youth, parents, researchers, and educators. Overlaying these four perspectives of information quality allows us to consider various interests in a single framework.

Following Ito et al.'s (2010) logic, we do not see youth as "passive recipients of dominant and 'adult' ideologies and norms" (p. 7). Attempts to understand youth only in terms of adult ideologies and norms will fail to capture the reality of youth experience. Nonetheless, some adult norms, like attention to credibility, are important goals for youth education. Therefore, the information quality framework is inclusive of both youth and adult perspectives, so that educational interventions and future research can account for multiple and varying experiences of information quality.

2. SCOPE AND STRUCTURE

2.1 Scope

In order to keep this review at a manageable level, we have focused almost exclusively—except for framing purposes—on specific literature at the intersection of digital media, youth, and information quality. Notably, we do not seek to cover all digital media; as with Walraven, Brand-gruwel, and Boshuizen (2008, pp. 633-635), for the most part we exclude studies of non Web-based electronic resources, such as library databases, since our interest is not in digital interfaces themselves, but with the ecological changes that come from the possibilities of networked communications.

We have primarily focused on works from library and information science, sociology, and education. We also review ethnographic studies, and engage with the new interdisciplinary research area of "new literacies" (Coiro et al., 2008). Literature surveyed in this review is largely, though not exclusively, published in English and/or the U.S. context. Similarly, the data about usage patterns is mostly U.S.-focused.

Lastly, this review aims to provide an overview of the state of research for the purposes outlined above, rather than to interrogate individual studies. As such, we do not engage in a detailed discussion of methodological issues.

2.2 Structure

2.2.1 *Process*

Based on a reading of the literature and existing syntheses (Walraven et al., 2008), this review divides the process of youth interaction with information into several phases: determining information needs, searching for information, evaluating information, adapting and applying information, creating new information, and disseminating information. Although these stages are analytically distinct, they are not always clearly separable in practice and do not necessarily follow in this order. Consider, for instance, a situation in which a news story is posted on the wall of a young user's social networking site and where subsequent search activities are a means to compare the story with alternative sources after the initial evaluation of the news story led to doubts about its credibility. Thus, the categories are adopted less as fixed sequences than as an organizing scheme in order to map the literature onto it.

2.2.2 *Sections Overview*

Building upon the framework and terminology outlined in the previous two sections, the following sections are organized as follows:

Demographics and Patterns of Use (3): This section establishes the context of youth information seeking by distinguishing between the personal, social, and academic contexts and discussing different information needs of youth. Demographics of online youth will help us to understand how the youth digital context fits into the larger societal context. These contexts determine the information needs towards which youth adapt and apply information and set the stage for the following sections.

Search (4): This section focuses on behavioral descriptions of the search process. Here, we draw predominantly from literature taking an adult-normative perspective, although we have tried to interpret the results in a more ethnographic way. The section starts with a discussion of search in the digital context and localizes it within the wider matrix of youth information-seeking behavior, followed by a discussion of why youth embrace the Internet as a source of information. We then summarize the literature describing general patterns in youths' information-seeking behavior and discuss contextual and demographic variables that may cause deviations from the main pattern. Section 4 ends with an overview of the major problems that the literature has identified youth as encountering in this process.

Evaluation (5): In Section 5, we look at how youth evaluate information. In this section, we primarily adopt an adult-normative perspective, although we also include comparisons and discussions of literature with systematic and prescriptive perspectives. Section 5 starts with a brief discussion of the notion of "evaluation" as part of the information-seeking process, focusing on how youth make quality judgments. It identifies a set of criteria that play a key role in quality determinations, but also looks into contextual and demographic variables that may help us to understand which criteria a youth will prioritize in a given situation. Section 5 ends with an overview of the problems that youth face when it comes to information evaluation, as identified in the reviewed literature.

Creation (6): Section 6 examines youth information creation and dissemination. Again, in this section, we employ all four perspectives of information quality. The focus of this section will be on the personal and social contexts and sets the stage for further exploring how skills acquired in these contexts may translate into the academic context as far as information quality considerations are concerned.

Information Learning and Education (7): Section 7 considers the ways in which youth acquire or learn their information-seeking, evaluation, and creation behaviors, with possible or suggested crossover from the personal and social contexts to the academic. In Section 1, we frame skill in two ways- as an input that modulates performance in search, evaluation, and creation in multiple contexts, and as a product which can be targeted, improved, and augmented through learning. Section 7 addresses, in turn, efforts to learn and to *learn through* search, evaluation, and creation in our three contexts.

3. ONLINE DEMOGRAPHICS

3.1 Patterns of Use

3.1.1 Who is Online?

Ninety-five percent of all teens (ages twelve to seventeen) in the United States are online (Pew Internet/Lenhart et al., 2011), and seven out of ten young people (ages eight to eighteen) go online daily (Kaiser Family Foundation/Rideout, Roberts, & Foerh, 2010). There are about equal percentages of girls (95%) and boys (93%) who go online (Pew Internet/Zickuhr, 2009). Older teens are more likely to go on the Internet than younger teens: 92% of teens aged twelve to fourteen are online, compared to 96% of teens aged fifteen to seventeen (Pew Internet/Zickuhr, 2009). A breakdown by race and ethnicity shows that 96% of white, 92% of black, and 87% of Hispanic teens are online (Pew Internet/Zickuhr, 2009). In Central Harlem and Bedford Stuyvesant, two historically black communities in New York City, only 4% of the 130 youth from ages fifteen to eighteen sampled through street interviews reported never using the Internet, with 29% using it every day and 40% using

it a few times a week (Bleakley, Merzel, VanDevanter, & Messeri, 2004, pp. 744-5). As Internet use becomes more pervasive, the information youth encounter online becomes more central to their lives.

3.1.2 *From Where Do Youth Go Online?*

Most teens access the Internet at home (89%), school (77%), someone else's house (71%), or a library (60%) (Pew Internet/Zickuhr, 2009). Recent statistics from the UK show a similar rate of 90% for use of the Internet from home among young teens ages twelve to fifteen (Ofcom, 2011). At home, teens are significantly more likely to go online in an open area (73%) than in a private area (26%). Additionally, teens (ages twelve to seventeen) increasingly enjoy mobile access to the Internet, as wireless devices (such as laptops, cell phones, and PDAs) become more powerful and pervasive (Lenhart & Madden, 2005, p. ii). About one in five teens report owning PDAs or Blackberries (Pew Internet/Rainie, 2009b, p. 9). The physical setting and context can influence the purpose and patterns of online youth behavior.

3.1.3 *What Do Youth Do Online?*

While social networking and content creation have been at the center of attention in recent studies, youth activity on the Internet runs the gamut from information seeking to communication to creative endeavors (Pew Internet/ Lenhart, Purcell, Smith, & Zickuhr, 2010; Pew Internet/Lenhart & Madden, 2007, p. 25). The following section presents data on youths' online activities on a *interactivity spectrum*—from relatively passive activities, requiring minimal user input and interaction, to more interactive activities, requiring more user input and interaction, to highly creative activities, emphasizing the user's creative input. The list of activities is by no means comprehensive.

3.1.4 *Relatively Passive Activities*

Information gathering has been shown to be a more popular activity among teens (ages twelve to fifteen) than social networking, online communication, or content creation (Pew Internet/Lenhart & Madden, 2007, pp. 25-26). Personal activities take the lead in this category. Entertainment information seeking showed the most participation rate (81%), followed by getting news online (77% participation rate) (Pew Internet/Lenhart & Madden, 2007, pp. 25-26). One-third of youth ages twelve to seventeen (31%) looked for health information online, and 17% looked up sensitive health issues (Pew Internet/Purcell, 2010). In the UK, 66% of British twelve- to fifteen-year-olds reported using the Internet weekly to seek out "information" of any kind (Ofcom, 2011). Of the 96% of 130 surveyed New York City inner-city youth who used the Internet, 90% used it to look up music lyrics/sports pages, 51% used it to look up information on health issues, and 82% used it to look up information in general (Bleakley, Merzel, VanDevanter, & Messeri, 2004, p. 745).

3.1.5 Interactive Activities

Whereas information seeking falls on the rather passive end of the interactivity spectrum, activities like social networking and communication demand more user input and active user participation.

Receiving and sending email is by far the most popular online activity. Fifty percent of Internet users use email daily. (Pew Internet/Fallows, 2009, p. 1). Eighty-five percent of teens (ages twelve to seventeen) use electronic modes of communication (email, instant messaging (IM), social networking sites, etc.). Inner-city youth interviewed in New York City use the Internet for e-mail (72%), chat rooms (66%), and games (83%) (Bleakley, Merzel, VanDevanter, & Messeri, 2004, p. 745). Interestingly, teen users associate email with formal modes of communication and prefer to use instant messaging and social networking sites when communicating with friends (Lenhart & Madden, 2005). Twenty six percent of teens send messages on social networks daily, 24% use instant messaging daily, and 16% send email daily (Pew Internet/Zickuhr, 2009). Although the data is not as granular as those on the US, recent British statistics find fewer young teens (73%) ages twelve to fifteen using the Web for communication "on a weekly basis" (Ofcom, 2011).

An ever-increasing number of youth who are online are treating the Internet as a social medium where they meet and interact with others. Eighty percent of online teens (or 76% of all teens ages twelve to seventeen) use social media, such as Facebook, MySpace, and Twitter (Lenhart et al., 2011). In Europe, the numbers are similar: A random sampling of 25,142 Internet-using nine- to sixteen-year-olds across 25 European countries found that the percentage of youth using social networking sites increases quickly with age, from 25% among nine- to ten-year-olds, to 49% among eleven- to twelve-year-olds, 73% among thirteen- to fourteen-year-olds, and 82% among fifteen- to sixteen-year-olds. By country, the Netherlands (80%) and Lithuania (76%) have the highest proportion of young users; Romania (46%), Turkey (49%), and Germany (51%) have the lowest proportion of youth to adults on the web (Livingstone, Haddon, Görzig, & Ólafsson, 2011, p. 5). The increase in social networking site use with age is equally quick in the UK, where 28% of eight- to eleven-year-olds and 80% of twelve- to fifteen-year-olds have set up pages or profiles on social networking sites (Ofcom, 2011). In the U.S., of those who use social networking sites, 84% write on a friend's page or wall (Pew Internet/Zickuhr, 2009), 82% send private messages to a friend (Pew Internet/Zickuhr, 2009), and 54% engage in instant or text messaging (Pew Internet/Lenhart, 2009a).

Social media can also serve as outlets for creative efforts, and personal networks form major resources for information seeking. For instance, IM is much more than a text-based communication medium; it is "a multi-channel space of personal expression for teens" (Pew Interet/Lenhart & Madden, 2005). Vast

amounts of information (including photos, music, and video) are circulated and shared using social media like IM.

3.1.6 *Creative Activities*

Content creation is a fast growing area of Internet activity (Pew Internet/Lenhart & Madden, 2007). Close to two-thirds (59%) of all youth ages twelve to seventeen engage in content creation on the Web (Pew Internet/Lenhart & Madden, 2007). Online content creation activities range from: maintaining an online journal or blog (28% of online teens); building a personal webpage (27%); creating a webpage for friends, school assignments, etc.; sharing an original work (photos, stories, etc.) online (33%); to remixing content (26%) (Pew Internet/Lenhart & Madden, 2005, 2007). Older teenage girls (ages fifteen to seventeen) were found to engage in content creation activities much more than boys in the same age group, or boys and girls of younger age (ages twelve to fourteen) (Pew Internet/Lenhart & Madden, 2005).

3.2 Youth Experience of Information Quality

From the usage patterns described in the statistics above, it can be extrapolated that the majority of the digital information with which youth interact relates to personal and social usages, as schoolwork is not one of the top reasons for which youth use the Internet. From an ethnographic perspective, it is therefore likely that youth experience information quality issues—usually implicitly, as further discussed in Section 5.4—mostly in the personal and social context. For instance, evidence from focus group interviews (Palfrey & Gasser, 2008) suggests that young users care about the information quality of profiles on social networking sites. A profile may be considered low quality if it is inaccessible because of high security settings, incomplete because it does not give as much information as the youth would like, or inaccurate, because it gives deliberately false information, either to joke around or to seek protection through misdirection and obfuscation. Similarly, if youth are engaging in online content creation, they might recognize badly done video mashups, with quality problems like the audio not being properly synced, inserted animations not integrating with the background video, or the video having a low resolution, or they might see it as a pressing quality issue that commercial music videos released on YouTube are of lowered resolution.

While an ethnographic perspective emphasizes information quality issues crystallizing in the personal and social context, this paper is more focused on information seeking in the academic context and corresponding quality issues that arise. The personal and social contexts, however, remain important as they demonstrate *how* youth may evaluate quality in their "favorite" contexts, find ways to increase the quality of the information, or seek better and higher-quality information, in ways potentially applicable to schoolwork.

4. INFORMATION SEEKING

4.1 Introduction

4.1.1 Search in the Digital Context

The Internet has been radically transforming the way youth seek and access information. Before the Internet, the academic research process for most students could be over-determined by the intervention of adult authority. Students began with their school-issued textbooks and progressed to library research, which was as limited by their skill level and sophistication as it was by the library's collection or opening hours. Now, it is very simple for a student who, say, does not like a textbook's explanation of a particular topic to research it online, day or night, and to find different information without adult oversight. The information available online may also include forms which are rarely found in a library such as pirated entertainment content, self-published research and opinion, video games and other media, and peer discussion boards.

Social networking sites are a notable part of the expanding world of digital information. These sites have numerous resemblances to older public spaces (boyd, 2008) but also create a new social ecology that even the networking tools' creators may not understand (e.g., Zuckerberg, 2006; see also comment in Palfrey & Gasser, 2008, pp. 3-4, and Weinberger, 2007, on "digital settlers" versus "digital natives"). At the intersection of the social and digital contexts, searching (for people and information about people) is a part of socializing. One possible implication of this is that social-level tools may be a part of something akin to what in adult contexts is understood as credibility evaluation (Lankes, 2008, p. 114).

While recognizing the wide range of purposes for information seeking (and for *learning* to search, in Section 7), this section is devoted largely to search within the academic context, as most research examining how youth conduct searches use a school task as the focus (Fisher, Marcoux, Meyers, & Landry, 2007, p. 2). Additionally, this section draws from the many studies examining how youth search for health information. Two illustrative examples in this area include the respective topics of queer youths' use of Internet search and youths' search for information regarding illegal drugs. Research on these two topics evidences the importance of investigating how youth search for information online.

For example, queer and transgendered youth may combat their frequent marginalization in daily and even family life by seeking out information online. This is documented in a study by Mehra and Braquet (2006, pp. 105-106), who conducted in-depth narrative interviews and informal discussions

with 21 youth participants who self-identified as gay, lesbian, bisexual, or transgender. Mehra and Braquet find that queer youth use the Internet for a wide variety of information seeking related to the process of coming out. They visit message boards and chat rooms, search websites for coming-out stories, consume media about out visible queer public role models, look up listings of local groups and clubs, buy merchandise, visit dating websites, consult queer legal websites and advocacy organizations, subscribe to keyword alerts from Google, and even explore anti-queer websites and email lists as a way of researching anti-queer rhetoric (pp. 111, 113, 115). Similarly, in an ethnography of queer youth in the rural U.S. United States, Gray (2009, p. 177) notes that queer youth "search online to determine what's 'expected' of queer boys and girls." In short, online search appears to be a major component or correlate of the coming-out process.

When it comes to illegal drug use, youth would have previously been unlikely to get arguments about and information relating to potentially safe use of illegal drugs through print or broadcast media or through authorities in their lives. Those who engaged in illegal drug use were at the mercy of the knowledge and practices of local underground communities.[5] But now, a site like Erowid (http://www.erowid.org/) makes available the knowledge and expertise of countless individual drug users. Users share their experiences to help inform others who previously would have never had access to such knowledge about the precise bounds of harm, in what one of the site's founders calls "grassroots peer-review" (Davis, 2004). Online information on illicit drugs is perhaps the most suggestive example of how the absence of traditional gatekeepers engenders a complicated information landscape, capable of facilitating honest exchange and empowerment as well as danger and harm.

These examples show that, as adults concerned with the welfare of youth, it is important for us to look at how youth search for information in the digital context. While considering how youth evaluate information is no less important, understanding what information youth are able to *find* is more urgent than it once was. This necessitates looking at the entire process of interacting with information in a new way.

4.1.2 Relationship to Existing Literature

This paper reviews literature from several disciplines and various fields of inquiry. We draw on literature on credibility in Section 5 and research perspectives on new literacies in Sections 6 and 7. These fields rarely focus specifically on youth information seeking, nor do these bodies of work discuss information seeking as part of their analysis of evaluation practices.[6] By way of comparison, we consider also the small but discrete fields of information seeking, also called information-seeking behavior or information behavior (Chelton & Cool, 2004, 2007; Shenton, 2010), and information problem-solving (IPS) (Brand-gruwel & Gerjets, 2008, p. 616). IPS, which looks at the entire process of

searching for information, has identified a set of activities that some researchers have used to define information literacy (Walraven, Brand-gruwel, & Boshuizen, 2008, p. 623; Brand-gruwel & Gerjets, 2008, p. 616). However, information-seeking research and IPS do not appear to communicate strongly with each other.[7]

When it comes to the specific subject of youths' online search behavior, most of the literature reviewed in this section comes from the field of Library and Information Science (LIS), which is centrally concerned with searching for informational resources. However, this review does not borrow the field's specific models for search; rather, this section is structured around thematic categories, similar to the earlier literature review by Kuiper, Volman, and Terwel (2005).[8]

4.1.3 The Digital Context, in Context

Youth information-seeking activities often span both online and offline media, including human resources, printed sources, and others. Online search activities may constitute one part of the entire information-seeking process. Thus, while the Internet presents new considerations that require concentrated analysis, it is just as important to consider how online information-seeking activities relate to those offline.

Some studies focus on the dichotomy between online and more traditional information sources and conclude that in general youth consider information from traditional sources to be more credible than information on the Web. In a Kaiser Family Foundation survey, for instance, Rideout et al. (2001) find that young people (ages fifteen to twenty-four) trust health information from traditional sources such as parents, doctors, school, friends, and TV much more than online information. Gray et al. (2002, p. 551) find that the 15 female participants in her study, ages eleven to eighteen, generally expressed that the Internet would not be the "first port of call" for health information, but that they would instead first turn to their families and family doctors.

Yet in practice, online and traditional sources do not necessarily present an either/or decision for youth. In a survey of perspectives and methods in research on youth information seeking, Shenton (2004, p. 245) notes that studies focus either on "using predominantly paper sources" or "using mainly or exclusively IT-related resources" to find information, and seldom look at how the two might relate. In further contrast to the findings of Gray et al. (2002, p. 551), Boyar, Levine, and Zensius (2011, pp. 25-26) find in focus groups conducted with youth of Oakland, California and Chicago, Illinois that the Internet frequently *was* the first port of call, but that it was used to make decisions about whether or not to see a doctor or professional and complemented a wider range of sources. Large and Behesti's (2000, p. 1075) student participants expressed the opinion that online and offline sources compliment

one another- for example, books can contain old, and thereby more easily usable, information, but the Internet provides information not found in books. They conclude that for their study participants, "whether the Web was better or worse than printed sources is not a question that can be answered with a simple yes or no" (Boyar, Levine, and Zensius, 2011, pp. 26).

Similarly, Ng and Gunstone (2002, p. 492) find that their study's student participants express a range of views regarding preferences for informational searches and the complementariness of the Web and traditional sources. They worked with 22 fifteen-year-old students in Ng's Australian high-school classroom, where students taught themselves about photosynthesis and respiration from online sources in conjunction with teacher supervision and laboratory activities. When asked how they would prefer to learn about photosynthesis and respiration if they were to do it again (pp. 498-499), some said they would prefer to use both Web and traditional sources for their complementary benefits. Others said they would prefer to use books for future research, for reasons including ease of understanding and directness of information. Those that preferred the Internet noted the appeal of greater amounts of more recent information and an easier and faster search process than is possible with books. Roy, Taylor, and Chi (2003, pp. 237, 244, 247), in a study asking 28 eighth-grade students to search for answers to discrete, well-defined questions, point out that the Web often contains short documents, specific to target information queried, whereas library resources consist of books with extensive background information relevant to multiple questions, further suggesting complementariness. Though Jones' findings (2002, p. 275) affirm the above, he adds that youth might use different information sources for varying purposes.

4.1.4 Models of Search, and Searching Versus Evaluating

Many of the studies included here frame evaluation as a subset of information seeking (Walraven, Brand-gruwel & Boshuizen, 2008; Marchionini, 1989; Fourie, 1995; Kuhlthau, 2004; Kuhlthau, Heinström & Todd, 2008; Shenton & Dixon, 2003a; Roy & Chi, 2003). Youth evaluate information at all stages of the search process, not only their results at the end; they evaluate when they filter results, and even when they select search tools, especially search engines, that are information objects in themselves. While recognizing that search and evaluation are inextricably tied, this review distinguishes between the two by using "search" to describe behavior (following the definition of behavior by Shenton, 2004, below) and "information evaluation" to refer to the thought behind the behavior, explored at greater length in Section 5.[9]

Previous models of information seeking present it as a process, possibly iterative, and theoretically divide it into a sequence of stages. In a study of 14 eighth-graders, Roy and Chi (2003, p. 340) developed a model consisting of the four stages of: "1) submitting a search query in the Google search

window; 2) scanning the list of returned document excerpts which contain links to documents; 3) selecting, opening, and browsing a particular document; and 4) book marking a document location or taking notes." Arranging the four stages as a flow, they created a model where a particular stage in a search may lead to another iteration, with the overall search process consisting of multiple iterations of individual searches. Iteration may also occur within one stage, such as browsing multiple documents after scanning a single page of search results (p. 342).

The conception of search taken by this review, however, is more similar to those of Shenton (2004) and of Wallace, Kupperman, and Krajcik (2000, p. 78). Shenton (2004, p. 244) gives a basic definition of searching as "the action taken by an individual to locate messages in order to address a perceived information need," with an "information need" defined as "the desire or necessity to acquire the intellectual material required by a person to ease, resolve or otherwise address a situation arising in his or her life" (Shenton & Dixon, 2003a, p. 8). Wallace et al.'s (2000, p. 78) category of "information gathering" is a subset of the information-seeking process. They define information seeking as "posing or identifying a question or problem, exploring available information, refining the question, gathering and evaluating information, and synthesizing and using information." They use the term to "refer specifically to the activity of searching for and retrieving information, separate from the reflective processes of posing and refining questions and evaluating and synthesizing what is found." Section 5 continues to expand on these observations of youth behavior.

4.2 Main Behavior

4.2.1 Beginning a Search

Research findings on youths' search behavior reflect the advances in online information retrieval systems over time. Whereas Guinee, Eagleton, and Hall (2003) found that youth often tried to use keywords to guess at website URLs (p. 364), recent research finds that search engines are used ubiquitously by youth (Bilal & Ellis, 2011; Rowlands et al., 2008). For example, Druin et al. (2009) find that 10 out of 12 student subjects report using Google and feel positively about it as a search tool. Nevertheless, these same students who use Google show limited fluency with its full functionality. In fact, youth encounter numerous difficulties with search engines despite their ever-increasing effectiveness. Youth often struggle to translate their search objective into appropriate keywords, to formulate search queries, and to understand the logic of search results (Druin et al., 2009; Beheshti, Bilal, Druin, & Large, 2010; Dhillon, 2007). When faced with these difficulties, youth often turn to alternative search strategies that require less cognitive load, such as browsing and clicking through links (Beheshti et al., 2010). Although these alternative strategies may not take full advantage of search engines' optimal functionality, they reveal youths' capacity for adaptive searching behavior.

Demonstrating one such alternative search strategy, Madden, Ford, Miller, and Levy (2006, pp. 744, 750) find that subjects would try inventing URLs to find information. For example, when searching for the English band Blue, one subject entered "www.blue.uk/bands"; another subject tried searching for wildlife in Kenya by entering "www dot wildlife" into the address bar (p. 751).

Schacter, Chung and Dorr (1998, p. 843), in an early study of 32 fifth- and sixth-grade students with five months of experience with the Internet as an educational resource, find a preference for searching by browsing. In 80% of cases, students went about finding information by browsing (clicking through hypertext links or by going back or forward in the browser), only sometimes using keyword searching in search engines or returning to a page of search engine results (pp. 844, 848). Recent work finds that youth still employ a browsing search strategy, likely because of difficulties using search engines (Beheshti et al., 2011). In light of youths' alternative search strategies, some scholars recommend youth-oriented interface design that facilitates navigation and information discovery through browsing (Druin, 2005; Large, Beheshti, Clement, Tabatabaei, & Tam, 2009; Beheshti, Large, & Julien, 2005; Beheshti et al., 2010).

In those instances when youth do make use of search engines, they employ varying strategies. Youth will vary their use of single or double keywords, simple phrases, or natural language as search queries. In an analysis of 93 eighth-graders, Guinee, Eagleton and Hall (2003, pp. 368-370) identify common patterns when youth formulate search queries, including single keywords, keywords with focus terms, incomplete phrases, and natural language. Druin et al. (2009) confirm these findings and add that youth prefer not to employ Boolean phrases and have difficulty performing multi-stage searches, as in instances when certain information is prerequisite for completing the ultimate search goal. In a study of 110 Swedish students ages six to seventeen, Enochsson (2005) found that youths' search strategies varied depending on information-seeking experience and knowledge of how search engines work. For example, more experienced students who know how search engines return results use keywords that they predict the website creator has included.

With regards to planning out search steps in advance, Shenton and Dixon (2004, p. 179) find among students, ages four to eighteen, that most preferred to make decisions "at the point of need." Only a few older students "developed, either in advance of or during information-seeking activity, plans on how they would use different approaches or sources in concert [or engaged in] preliminary planning in devising search words" (p. 195). Additionally, Agosto (2002a, p. 19; 2002b, pp. 319, 331), Shenton and Dixon (2004, p. 192), and Fidel et al. (1999, pp. 26-27) observed students preferring to return to known sites as much as possible, even in the case of unrelated searches.

4.2.2 Navigation and Reduction Behavior

Druin et al. (2009), through observation of 12 youth age seven to twelve years old, find that youth using search engines rarely look beyond the first page of search results and typically select the first results. They also find that youth rarely make use of search suggestions offered by the search engine. Torres and Weber (2011) find that very young users tend to select links from a search results page that are prominently displayed, included advertisements and sponsored results. In an analysis of web query logs, Torres, Hiemstra, and Serdyukov (2010) suggest that youths' difficulty identifying relevant search results leads to longer search sessions and more search entries.

Hirsh (1999, p. 1268), in an exploratory study of 10 fifth-grade children, all of whom had access to at least one computer at home and seven of whom also had Internet access at home, finds her subjects sorted through search engine results by relying on the summaries to preview content (p. 1273). They preferred results with clear reference to their topic, such as titles having the exact words of their subject (p. 1279). Similarly, Wallace and Kupperman (1997, pp. 7, 9) conducted a study among 8 sixth-grade students, find that their subjects initially scanned for keywords and then much later examined the context of those keywords (p. 16). Madden, Ford, Miller and Levy (2006, pp. 744, 750), in their 2003 study of 15 English children between the ages of eleven and sixteen, find their subjects clicking through links to sites based on the search result summaries. This tendency resulted in some instances in arriving at Amazon.com pages with descriptions of a topical book but with no substantial information (p. 754). Bilal (2000, p. 655; 2001, p. 123) finds that, when encountering this problem, students backtrack to the search page through use of the "Back" button, scrolling, and navigating hyperlinks from search engine results.

4.2.3 Visual and Interactive Elements

When searching through websites, youth pay great attention to visual and interactive elements (Agosto, 2002a, 2002b, 2004b; Bilal, 1999, 2004; Hirsh, 1999; Fidel et al., 1999; Kafai & Bates, 1997; Large & Beheshti, 2005; Jacobson & Ignacio, 1997). Interactive elements range from as simple as a profusion of links (Agosto, 2002b, p. 317; Jacobson & Ignacio, 1997), to the ability to customize interface, to multimedia such as animation, either passive (Kafai & Bates, 1997, p. 108) or interactive (Jacobson & Ignacio, 1997). Kafai and Bates (1997, p. 109), in a study of 196 students in first- through sixth-grade classrooms, find that youth much preferred to explore and engage sites with engaging graphical, multimedia and interactive elements, so much so that they often ignored text-only sites. Bilal (2004, p. 278) confirms these results.

Graphics considered attractive include large type fonts, bright colors, animated graphics, and a low ratio of words to graphics (Agosto, 2002b, p. 327). While color and layout also prove to be central in

determining which sites youth use, some students do consider the quality of the graphics and multimedia (rather than the graphics or multimedia indicating quality of the page), and sometimes proved to be discerning about visual simplicity (Large & Beheshti 2004, p. 1151).

A common preference seems also to be for quantity of information, rather than any considered analysis of what that quantity contains (Hirsh, 1999, p. 1272; Agosto, 2002b, p. 338; Shenton, 2004, p. 193). Youth prefer sites that present large quantities of information. This is surprising considering contrary impulses towards reduction and a bias against large amounts of text; however, combining results of various studies, it can be surmised that sites with large amounts of multimedia (rather than text-based) information are most preferred. Agosto (2002b, pp. 316, 325, 338) also reports her subject preferring not just on the *presence* of graphics and multimedia, but the *quantity* of graphics and multimedia.

How searching specifically *for* visual and interactive elements affects searching is an issue of growing importance. According to data from comScore, Inc. (2008), in November 2008 YouTube surpassed Yahoo! to be the search engine with the second-highest number of search queries in the U.S., behind the search engine of its parent company, Google. To date, no studies have been found that look specifically at how youth search for videos, and no recent studies looking at searching for images and graphics (i.e., recent enough to take into account "image search" options in search engines; an older study considering this is Hirsh, 1999). Erstad, Gilje and de Lange (2007, pp. 193-194) note that pictures, fonts, symbols, moving images and music that youth find themselves form the basis for material (such as remixes) they create.

4.2.4 Exploration

Within the three genres of participation (see discussion in Section 1.3) introduced by Horst, Herr-Stephenson, and Robinson (2010, p. 53) the genre of "messing around" includes how youth search in the personal context. Interviews for Horst et al.'s (2010, p. 54) ethnographic study found a strong majority of the participating youth engaging in what they call "fortuitous searching" within the genre of messing around, where fortuitous searching is a form of search involving moving from link to link in an undirected manner. Sometimes this was exploratory and sometimes it was focused. Focused searches were sometimes for homework or a school project, but were also for information like guides for particular video games. These searches then fanned out into undirected searches, where the participants would follow whatever they found interesting (p. 55). The study also had examples of youth searching by trial and error, discovering sites that were resources about a particular topic (such as Wikipedia for information about games) then revisiting such sites (p. 57). Horst et al. (2010, pp. 55, 57) comment that fortuitous searching "represents a strategy for finding information and reading online that is different from the way kids are taught to research and review information in texts at school,"

ways like working with a predetermined topic, identifying a purpose, predicting content, and summarizing the text, showing a specific way that the range of search behaviors varies according to context.

Notably, some studies indicate that exploring multiple sources does not necessary reflect a desire to find and compare multiple sources. Students who participated in Shenton and Dixon's (2004, p. 184) focus group interviews attested to reluctantly accepting their teachers' insistence that not all information required for an assignment could be found in a single source. However, the authors also find that using a single source was more prevalent in personal information seeking than in school assignments.

4.2.5 Ending

Factors other than finding satisfactory information can terminate the search process. Specifically, Agosto (2002b, p. 213) finds that "the onset of physical discomfort, the onset of boredom, time limit expiration, and information snowballing" would cause the youth in her study to stop searching for information. Physical discomfort can take the form of eyestrain and headaches from staring at a computer screen, back pain from sitting in front of a computer, or aching wrists from typing. Time limits might be self-generated (such as the scheduled time of a favorite TV show) or imposed (such as running out of time when using a shared library computer). Boredom might result from finding only irrelevant sites, from not finding engaging sites, or from delays in loading time, as found in the participants of multiple studies (Shenton, 2004, p. 193; Large & Beheshti, 2000, p. 1077; Fidel et al., 1999, p. 31; Kafai & Bates, 1997). "Information snowballing" is when the perception of massive amounts of information begins to overwhelm the user, causing frustration (Shenton, 2004, p. 193) and anxiety (Agosto, 2002a, p. 22). All of these might cause a youth to stop the search process, either accepting whatever information he has already gathered, or only later resuming the search process. Bound by these constraints, youth may engage in "satisficing" behavior (a portmanteau of "satisfy" and "suffice" coined in the 1950s), where they decide that information they have found is "good enough" and terminate the search (Agosto, 2002b; Meyers, 2009, p. 317).

4.3 Variables

Information-seeking behavior shapes and is shaped by the user's conception of information quality. This section describes a set of contextual and demographic variables[10] that cause variations in information-seeking patterns. This section attempts to provide a starting point for describing and understanding factors underlying such variability.

4.3.1 Purpose of Search and Motivation

The purpose of a given search exerts influence on youths' preferences for information seeking strategies, which in turn shape their experience of information and information quality. Youth information needs largely fall into two groups, academic and personal. Information seeking for personal purposes is known as "everyday-life information seeking," or ELIS[11] (Agosto & Hughes-Hassell, 2005, 2006a, 2006b). Building on ELIS work, Gross (2006, 1999, 2000a, 2000b, 2001) proposes the term "imposed queries," information-seeking tasks required in the academic context.

Youth find the self-generated tasks undertaken for personal reasons of ELIS to be far more interesting than imposed school-related tasks (Agosto, 2001; Gross, 2006) and are consequently motivated in ways they may not be for school projects. In contrast, imposed queries are usually more linear, having specific end goals along with intervening steps, such as interpreting the imposed query (Gross, 1995). Illustrating this are results from Bilal who, in three studies (2000, 2001, 2002a; summarized in 2002b) compared the success of 22 youth (ages eleven to thirteen) at three research tasks: a fact-finding task, where success was finding the answer to a given question; a research-oriented task, where success was printing out a series of pages found on a specific site; and a fully-self generated task, where success was finding information pertinent to a topic participants chose themselves. Results showed that 50% successfully completed the fact-based task, 69% partially succeeded in meeting the requirements of the research-based task, and 73% succeeded on the self-generated task (Bilal 2002b, p. 114). These results matched the preferences expressed by study participants: 47% preferred the fully self-generated task, with the other two tasks preferred by 20% each, and the remainder were unsure of their preferences.

How youth search for and process information depends in part on how motivated they are (Gross 2001; Metzger 2007). Heinstrom (2006) relates motivation to *learning style*, which takes into account students' willingness to invest time in the search process- "Students who conceptualize information seeking as finding the right answer to meet task requirements tend to judge relevance based on easy access, and choose information sources by fairly superficial criteria. Students who aim to understand a topic in depth would invest time to analyze multiple information sources, and take a wider perspective on their search topic." Even with ill-defined tasks in search based on imposed queries, those that allow students greater opportunity to take ownership of the search question result in more successful information seeking (at least from the adult-normative perspective; Schacter, Chung, & Dorr, 1998, p. 847; de Vries, van der Meij, & Lazonder, 2008, p. 650; Heinström, 2006, names this the "deep" learning approach). Working with 33 fourteen- and fifteen-year-olds, Agosto (2004b, p. 254; 2001) finds that students collaborated on search tasks in conscious attempts to transfer motivation for personal and social tasks to the classroom.

4.3.2 Gender

The impact of gender is a topic of great interest, as much research is concerned with how the world of computers has become a highly gendered space that excludes females despite early contributions by women to the development of computers and computing (Light, 1999; Facer, Sutherland, Furlong, & Furlong, 2001, p. 1999; Cohen, 2011; for reviews of literature, see Agosto, 2001; Roy, Taylor, & Chi, 2003, p. 231; Roy & Chi, 2003, p. 337). By "gender," this paper is referring to gender expression, rather than biological sex; many studies that examine gender do not distinguish between the two or assume themselves to be looking at biological sex (Agosto, 2004b, p. 245).

In the past, access to computers and computer skills were seen as critical factors limiting women's information seeking activities (Miller, Schweingruber & Brandenburg, 2001, p. 137; Schacter, Chung & Dorr, 1998). Among adults, persisting gender differences have been noted with regards to confidence, self-perception, and use of search engines. While debate continues as to whether women are as confident as men in their online skills, research finds that women's low self-perception of their online abilities may negatively impact their online behavior and motivation to use the Internet (Hargittai & Shafer, 2006, p. 444; Pew Internet/Fallows 2009). Additionally, a Pew Internet Study finds that 53% of men online, as opposed to 45% of women, use search engines on a typical day (Pew Internet/Fallows, 2008). With regards to youth and adults, recent studies suggest that the gender gap is closing with respect to Internet access and use (Dresang, 2005; Dresang, Gross, & Holt, 2007, p. 377; Miller, Schweingruber & Brandenburg, 2001; Large, Beheshti, & Rahman, 2002b; Agosto, 2004a, p. 41; see also Pew Internet/Lenhart & Madden, 2005). So too does research find that girls are as active as boys in seeking information online (Pew Internet/Lenhart & Madden, 2005).

Gender also appears to impact search and navigation strategies (Schacter, Chung, & Dorr, 1998, p. 845; Roy & Chi, 2003; Large, Beheshti, & Rahman, 2002b; Akin, 1998; Lorigo et al., 2005; Arcand, Nantel, & Sénécal, 2011). Roy and Chi (2003, pp. 338, 343) find that among 14 students ages thirteen and fourteen with similar familiarity with (and access to) computers, Google, and the target (i.e. content) domain of a search assignment, boys and girls performed searches differently and had different learning outcomes. Boys submitted more searches before browsing, characterized as "tend[ing] to filter information at an earlier stage of the search cycle than girls [do]" (p. 344). Conversely, girls moved more between search results of a single search and within single documents, suggesting that "girls were much more linear and thorough navigators than boys" (p. 344). Roy and Chi (2003) conclude that independent of gender, those employing more searches were more successful than those who were thorough within searches (pp. 345-346). Adopting a slightly different position, Roy, Taylor, and Chi (2003) suggest that girls are less successful at completing academic tasks through Internet searching than are boys. Large, Beheshti, and Rahman (2002) find that "boys formulated

queries comprising fewer keywords than the groups of girls, the boys spent less time on individual pages than the girls, the boys clicked more hypertext links per minute than the girls" (p. 427).

Notably, gender differences in search performance online do not necessarily apply to non-Web forms of digital search. Using the same setting, equipment, tasks, and measures as Roy and Chi (2003), but incorporating search on a school library network, Roy, Taylor, and Chi (2003, p. 234) find that the gender differences in Web-based search are erased in library search. Based on these results, they explain that boys and girls "do not differ in their ability to search for, locate, and summarize information when using the school library. However, when using the Web for an identical search task, boys performed significantly better than girls on both target-specific information and target-related information" (Roy & Chi, 2003, p. 337). This study affirms the gendering of online spaces and demonstrates how the online context can alter youths' use and performance of search.

4.3.3 Age / Development and Experience

Theories of cognitive development suggest that as youth grow older, they successively develop the ability to conceive of a difference between fantasy and reality, then the ability organize thoughts and think logically, and finally, the ability to understand causal relationships and to reason abstractly. Presumably, these patterns hold for online information seeking (Eastin, 2008, pp. 30-32).

Social understandings of development (Meyers, Fisher, & Marcoux, 2009, p. 306) yield similar predictions. Indeed, Peter and Valkenburg's (2006, pp. 300-301; discussed below) survey of 749 Dutch thirteen- to eighteen-year-olds found that, independent of other factors, older students were more likely to use the Internet as an information medium. Yet while theories of development apply to online information seeking, not all research indicates that perceptions and performance online search change linearly with age. In a study of 295 seventh to eleventh graders, Madden, Ford, and Levy (2007, p. 343-347) find that ninth graders relied on the Web as their primary information source, whereas tenth and eleventh graders did not. Gerjets and Hellenthal-Schorr (2008, pp. 706, 708-709), working with 61 seventh- and eighth-grade students, find that the eighth graders fared no better than the seventh graders at online search performance. On the other hand, ninth graders have shown superiority to seventh and eighth graders at distinguishing between searching by keyword and searching by topic (Jacobson & Ignacio, 1997)

While perceptions and performance of online search may fluctuate across a narrow range of ages, consistent patterns hold up across a wide range. Rose, Rose, and Blodgett (2009, pp. 9, 15) show that among students ages seven to twelve, the impact of website interface design on youth memory changes across age. They found that older students performed equally well at using a map (82% accuracy) and a

content list (89% accuracy) as navigational aids for search. Younger students fared much worse, achieving 36% and 60% accuracy with a map and content list, respectively. Furthermore, younger students benefited more from support—when given "learning cues" (pop-ups explaining the main point of a webpage) younger students' information recall increased greatly relative to that of older students.

Notably, age does not necessarily directly relate to Web experience, although the former is often used as a proxy for the latter. Dinet, Marquet, and Nissen. (2003, p. 540) find eleventh graders in their study (sixteen-year-olds) on average had less experience than did twelfth-graders (seventeen-year-olds), whereas Lazonder, Biemans, and Wopereis (2000, p. 578) observe more "expert" Web users among third graders than fourth graders. Nonetheless, research bears out that greater experience is often associated with more effective search behavior. Defining experts as users with more than forty-nine hours of experience and novices as user with fewer than eleven hours of experience, Lazonder, Biemans, and Wopereis (2000, p. 579) find that experts performed tasks almost four times faster than novices and that experts needed fewer actions to locate websites. However, there was no significant difference between the two groups for locating information *within* websites. These findings suggest that experience is a significant factor in navigating the links and connections, but not for searching within a site.

4.3.4 Socio-Economic Status (SES)

While concerns about digital divides originally focused on access to digital technologies, recent attention has focused on disparities in participation, as online activity can condition future educational and professional opportunities (Hargittai, 2010, pp. 94-95; Peter and Valkenburg, 2006; Hargittai, 2008b, pp. 939-943). Consequently, it is important to understand how lower SES Web users use the Internet differently than do their higher SES counterparts (Hargittai & Hinnat, 2008). Since little research on SES and youth Web users focuses on search or information seeking, this paper attempts to draw inferences or connections from studies on other types of usage.

Basic literacy affects youths' selection of Web-based social tools and services, and might also condition their decision-making in the search process. Zhao (2008) conducted surveys on instant messaging (IM) and MySpace usage with 432 students in the fifth-, seventh-, and tenth-grades, roughly split between those from low-achieving urban high schools (with 70% of students on government-subsidized lunch programs) and those from middle- to high-income suburbs. His results show that low SES youth adopted the two services in greater numbers earlier than their high SES counterparts, but that the latter group's usage of the tools matched or surpassed its counterparts later on. Zhao hypothesizes that such differences "may be attributable to the known disparity in the basic literacy skills between inner-city and suburban teens... Because spelling and fast-typing are central to IM use, kids who are weak in these

aspects may shun such activities." So too might literacy affect search behavior, as searchers with lower literacy levels may avoid large bodies of text. Indeed, Kuiper, Volman, and Terwel (2008, p. 668) stress the importance of "Web reading" skills to search performance.

4.3.5 Race / Ethnicity

Based on data from mail surveys completed by 515 African American and Caucasian American youth, on average twelve years old, Jackson et al. (2008, pp. 438-440) found several differences in online search along racial lines. African American females were most likely compared to all other groups to search for information about depression, mood, and mental illness; to search for news and current events; and to exchange photos. African American females were most likely and Caucasian American males least likely to search for information about health, diet, and fitness. African American females were most likely and African-American males least likely to surf the Web, make online purchases, make searches on the Internet related to a school report, make searches related to a hobby or interest, and use a search engine (p. 440). With little difference between genders, African American youth were more likely than Caucasian American youth to search for information about religious/spiritual information and jobs.

Culture may also play a role in information seeking among youth of color. Based on focus group findings, Boyar, Levine, and Zensius (2011, p. 10) relate that female youth in communities of color (African-American, Hispanic, and Asian) reported feeling enormous pressure from parental figures (parents, step-parents, and grandparents) to not be sexually active. While recognizing that such expressions do not directly convey anything about information seeking, it is speculated that this potentially leads to female youth of color turning to sources such as online information to gather information when they feel they cannot ask their parents about sex and sexual health.

4.3.6 Networks of Friends

A common finding in a wider set of literature is the human tendency to consult other people as a primary information source, across divisions of SES and age (Shenton & Dixon, 2003b, p. 220; Agosto & Hughes-Hassell, 2006b, p. 1425; Hughes-Hassell & Agosto, 2007). This is a pattern that holds for youth searching on the Internet, where youth will find websites through consulting others (either offline or through digital media). Agosto (2002b, p. 331), in her study of 11 ninth- and tenth-grade girls enrolled in a New Jersey summer science program for girls, found participants relied on recommendations from human sources (friends, teachers) rather than searches to arrive at sites for leisure use. In focus group interviews with 34 youth, Meyers, Fisher, and Marcoux (2009, pp. 313, 316) find youth consulting peers and adults for recommendations on information sources, and that such consultations took place during evenings between youth in separate neighborhoods through

telephones, instant messaging, and e-mail for those with access. Meyers et al. (2009, p. 317) also found redundancy, where information about the same topic was gathered from multiple (online and offline) sources for comparison with one another, and interpreted this as representing "a kind of information bricolage, gathering and assembling ready-at-hand information from varied persons and media in the course of a single problem, provided they were motivated to do so."

Another pattern found by Meyers et al. (2009, p. 327) was the preference of youth to consult peers about social issues even when adults were otherwise a preferred information source. Several reasons can account for this: embarrassment; a desire to assert autonomy; the perception that adults would not understand or relate to their issues, or that adults would not appreciate the sensitivity of information (such as a crush) and reveal it in public. Peer groups might organize in "information grounds," a temporary social conglomeration created to spontaneously share information (p. 328), which exists primarily in physical spaces but may also utilize chat rooms and other online spaces.

Beyond information seeking for concerns relating to the social context, Lankes (2008, p. 114) speculates[12] that youth may turn information seeking into a kind of collaborative "research" activity for a wider range of topics, where group members drawn from personal networks actively share information and information quality assessments using both online and offline media. The idea of a "techne-mentor" relationship (see discussion in Section 7) partially supports this; however, techne-mentor relationships are hierarchical ones, in which youth will develop expertise individually and then pass it on to others, rather than team relationships where youth work together. Still, taken as a whole, a group of peers valuing the developed expertise of others and sharing such expertise between one another does resemble collaborative research activity.

4.3.7 *Skill*

Flanagin and Metzger (2010) find that youth self-assess their search skills fairly high relative to other Internet users. Also, they find that youth self-assess their own search skills to be higher than their other Internet skills, such as technological skill (p. 28).

However, search skill is not equally distributed among youth. As a dependent variable, skill appears to be influenced by several of the previously discussed user characteristics, such as socioeconomic status, gender, race, etc. For example, Hargittai (2010) finds that, "Students of lower socioeconomic status, women, students of Hispanic origin, and African Americans exhibit lower levels of Web know-how than others" (p. 108).

At the same time, skill is a strong predictor of different types of Internet use, such as information-seeking activities (Hargittai 2010). The connection between socioeconomic status, skill, and search behavior supports previous research showing that higher socioeconomic status and education level are associated with "capital-enhancing" online activity, like online job searches (Howard, Rainie & Jones, 2001; DiMaggio, Hargittai, Celeste, & Shafer, 2004; Hargittai, 2010). Also, Hargittai and Shafer (2006) find that adult women, who report lower self-assessments of Internet skill than men, may be disinclined from conducting some kinds of searches because of a preconception that their search will fail. Again, skill's effect on search behavior can have external consequences, as women may be discouraged from searching for, "online content that may improve their life chances, such as enrollment in online courses, accessing government services, or informing themselves about political candidates" (Hargittai & Shafer, 2006, p. 444). If this trend also applies to youth, then gendered differences in skill self-assessment have implications for girls' search behaviors.

4.3.8 Variables Use Case: Health Information

Searching for health information online is a common activity for youth (Ybarra & Suman, 2008; Pew Internet/ Lenhart, Madden, & Hitlin, 2005; Kaiser Family Foundation/Rideout, 2001; Borzekowski & Rickert, 2001b). Therefore, health information provides a useful case study of how the previously discussed variables affect search behavior. Likewise, the object of a search, health in this example, can itself be seen as a variable that affects search behavior, whereby youths' search behavior changes depending on the object of their search.

Research over the past decade has yielded varying results on how, and how much, youth search for health information online. Rates of such activity among youth appear to vary not only over the course of the decade, but in research findings from the same years as well. For instance, Rideout (2001, pp. 1, 3) reports that 76% of youth ages fifteen to seventeen and 75% of youth fifteen to twenty-four had sought health information online. Assessing slightly different age groups around the same time, however, other studies show far lower rates (Pew Internet/Lenhart, Rainie, & Lewis, 2001, p. 6). While Borzekowski and Rickert (2001b) also observe lower rates than those of Rideout, they do find that the Internet is the second-most preferred information source for health-related topics among youth. Far more of their tenth-grade participants turned to friends for information on birth control and safe sex as well as dating and family violence than to the Internet (63.1% and 52.7% compared to 31.6% and 25%, respectively). For diet, nutrition, and exercise, the rate of Internet use approached that of using magazines and parents.

According to more recent research, the Internet has become the primary source of information about issues related to sexual health. 89% of survey respondents, ranging in age from thirteen to twenty-four,

indicated that they learn about sexual health-related issues online, slightly more than the 83% who turn to doctors or nurses (Boyar, Levine, & Zensius, 2011, pp. 20, 25). With regards to searching for any type of health topic online, the rates of online search are as follow: 24.0% of male thirteen- to fifteen-year-olds, 39.1% of female thirteen- to fifteen-year olds, 30.1% of male sixteen- to eighteen-year-olds, and 43.4% of female sixteen- to eighteen-year-olds reported searching online for health information "at least a few times a year" (ISIS, Inc., personal communication, July 6, 2011). Moreover, 2006 and 2008 surveys of twelve- to seventeen-year-olds from the Pew Internet & American Life Project show that 28% of twelve- to seventeen-year-olds have gotten health information online, far less than the 75% of adults who the same survey found to have gotten health information online or even the 68% of eighteen- to thirty-four-year-olds (Pew Internet/Fox & Jones, 2009, p. 5).

Some research has looked specifically at the impact of SES on searching for health information online, suggesting low SES youth may search for health topics online differently than their high SES peers. Borzekowski and Rickert (2001a) show that while the two groups might not search for overall health information online at very different rates, the specific topics searched for by each varied greatly. Their study compared 145 youth ages thirteen to twenty-one recruited from a health center serving ethnically diverse and disadvantaged youth in Central and East Harlem with 173 youth in grades nine to twelve recruited from an elite independent (private) school in New York City's Upper East Side. 42% of the health center youth reported using the Internet to get health information, compared with 43% of the elite high-school youth, with no significant effects from gender or ethnicity. However, the health center youth were more likely than the elite high school youth to have "tried to obtain information on sexually transmitted diseases (50% vs. 16%), sexual behaviors (50% vs. 11%), peer/gang violence (23% vs. 5%), dating violence (14% vs. 3%), parenting (17% vs. 0%), emotional abuse (12% vs. 1%), and sexual abuse (10% vs. 1%)" (pp. 54-55).

Zhao (2009) finds a meaningful negative correlation between parental education level (a useful proxy for SES; p. 1503-1504) and teens' online health information-seeking behavior. Bleakely, Merzel, Van Devanter, and Messeri (2004, pp. 744-745) indicate higher rates of health information seeking by lower SES youth. Based on street interviews with 130 fifteen- to eighteen-year-olds in Central Harlem and Bedford - Stuyvesant, two historically underserved New York City neighborhoods, they find 51% of subjects use the Web to search for health information online.

While findings that low SES makes youth more likely to turn to the Internet to find health information play into narratives of digital empowerment, Zhao (2009, pp. 1504-1505) cautions against this view. The above findings are not conclusive; moreover, higher rates of search do not guarantee that low SES youth are as efficient or effective at searching for health information as high SES youth.

Reasons for turning to online sources may include those discussed above in Section 4.3.6 "Networks of Friends," including embarrassment, desire to assert autonomy, and a mistrust of adults. In particular, Boyar, Levine, and Zensius (2011, p. 5) suggest that youth in the US whose schools' sex education programs follow abstinence-only models are likely to search online for sources of health information for comprehensive sex education.

As the literature cited in this subsection does not focus on specific search behaviors, at best it can be speculated how searching for health information might change search behaviors. Perhaps youth rely more heavily on specific websites rather than Internet searches relative to other topics, although the use of searches (11% and 12% of male preference and female preference, respectively) still outnumbers the use of specific websites (5% and 8%, respectively; Boyar, Levine, & Zensius, 2011, p. 20). Recommendations for online sources from friends may play a larger role than for other academic topics. Looking up health information online is, again perhaps more often than for other topics, used as a preliminary stage before turning to people and deciding whether or not to consult a professional, parent, or other adult (pp. 25-26).

4.4 Problems

Youth encounter various problems in the information seeking process. This section reviews the literature's treatment of these problems, while Section 7.2 is devoted to reviewing literature about pedagogical attempts to address such problems.

4.4.1 Information Overload

Chief among the problems youth experience in online search is information overload: the feeling of being overwhelmed by volumes of information. Flanigan and Metzger (2010) report that 61% of the 2,747 youth surveyed indicate problems with the amount of information online (p. 29). Overload can manifest in different ways. For instance, a searcher might find either too much or too little information applicable to her search. Information on one topic might also link to other voluminous topics or to conflicting sources. Such problems can occur in various combinations.

In addition to feeling overwhelmed by the Web as a whole, youth searchers may experience overload while searching within individual sites. Students in Agosto's study (2002a, p. 22) experienced "textual overload" working on individual sites. While such overload is not unique to the Web, the students linked it to their overall conception of the size of the Internet. Within the Web as a whole, students found too few informative sites for academic purposes and too many good ones for leisure. Similarly, students may be dissatisfied with the uncertainty that they have located the best possible search results

(Large & Beheshti, 2000, p. 1077). Improved search engine algorithms may have abated the low 'quality ratio' characterizing such problems; however, Kuhlthau et al. (2008) suggest more sophisticated search algorithms may increase the difficulty of identifying the best results from so many good ones in academic searches.

At its extreme, overload can result in anger, tension, stress, and even physical symptoms of headaches and fatigue (Akin, 1998). However, not all evidence points to overload being a major issue. Shenton and Dixon (2004) find that while their subjects did experience overload, it was only in the infrequent occasions when assigned school tasks were very broad (p. 182). They found that information seeking driven by personal interest did not result in overload, and they speculate that the reason is that for such purposes students could determine the boundaries of information seeking without feeling the need to be accountable to others (p. 191).

4.4.2 *Distraction*

Distraction during academic information seeking tasks is not a problem inherent to the Internet, yet the Web does provide more possibilities for distraction than previous information environments, particularly with self-directed learning. The Internet provides many opportunities for "distraction activities" such as following links, which can lead to wandering off-topic and, at times, forgetting the task at hand (Pritchard & Cartwright, 2004, pp. 27-29). Bilal and Kirby (2002) find that youth are more likely to deviate from search targets than adult graduate students. And while research shows that youth pay attention to visual elements, Large and Beheshti (2005) report that youth feel that gratuitous animation on information retrieval systems distract them from their search objectives. On the other hand, Large, Beheshti, Nesset, and Bowler (2006) find that some youth welcome a diversion from information seeking, such as games and puzzles built into information retrieval systems.

Distraction is not simply the result of a lack of motivation or focus. Students might become distracted by irrelevant pages, and grow resentful of their distraction, in spite of being focused on the task at hand (Large & Beheshti, 2000, p. 1076). Members of student government organizations, ostensibly highly motivated in academic work, can tend towards "off-topic conversations and playfulness" in digital search tasks as well (Goldman, Booker, & McDermott, 2008, pp. 194, 200).

4.4.3 *Complexity*

Kuiper, Volman, and Terwell (2005) review several studies that find students encountering information online that was too complex for them to understand. In Ng and Gunstone's (2002, p. 499) study with 22 fifteen-year-old students in Ng's high school classroom in a middle-class suburban area

of Victoria, Australia, some students located information about the class' scientific topic online that was too specialized, and preferred the textbook that presented the information at an age-appropriate level. In Large and Beheshti's (2000, p. 1072) study, a significant number of students (19 out of 50) found vocabulary used on Web sites challenging and required extra help from a printed dictionary or parents/teachers. While some students in the study preferred unabridged information geared towards adults, other students appreciated material specifically made for children (p. 1075). Shenton and Dixon (2004, pp. 182-183) found that the younger children in their study (age seven) would struggle with only finding material that was beyond their level of reading comprehension. Druin et al. (2009) report that the higher order thinking involved in complex information seeking poses a problem, especially for younger children.

5. INFORMATION EVALUATION

5.1 Defining Evaluation

We define evaluation as the stage of the information-seeking process when an information seeker decides to use (or not use) a piece of information she or he has found. The key outcome of evaluation is the information seeker's choice to use or not use a given piece of information towards the purpose that motivated the search. However, as we have discussed in the previous section, the ambiguities of consistently demarcating information objects make it is difficult to identify precisely when an evaluation has taken place. So instead, we focus our treatment of evaluation on *how* youth make these decisions. We do this by interpreting youth behavior in terms of evaluative criteria, which are the standards (explicit or implicit) by which youth judge information. Insofar as any information seeker makes decisions to use some information and not others, there will always be at least an implicit evaluation.

In this section, we first examine overall patterns of how youth evaluate information, including both literature examining "relevance judgments" and literature examining "credibility judgments." Then, we review the literature with an adult-normative perspective, describing youth behavior in terms of what it lacks or how it is deficient as compared to what adults do. We also briefly look into theoretical literature about credibility and scrutinize the adult-normative claims of youth deficiencies by comparing adult behavior and criteria to that of youth—not to suggest that there are no concerns, but to properly contextualize them. Lastly, we examine fears and concerns that are addressed by the credibility literature, focusing on youth. While many concerns stem from the perception that youth are more vulnerable than adults, several concerns apply to both groups. Such concerns often then also involve discussion of ideal conceptions of credibility or quality.

5.2 Quality and the Turn to Digital Media

To a degree, we can infer the kind of information criteria youth set out for themselves by examining youth motives for going online. In a study of 95 French students in grades eleven and twelve, Dinet et al. (2003) find that their subjects looked online for information because of "the interest of information found on the Web; the rapidity of access; the quantity; the recency; the superiority of the Web to give information; the possibility to learn to search for information by using the Web; the aesthetic of information; their accuracy and the number of examples" (p. 541). These reasons—accessibility, quantity, topicality, accuracy, comprehensiveness, aesthetic appeal, etc.—are what we describe as information quality criteria.

Sources discussed earlier in 4.1.3 (under "The Digital Context, in Context") provide more potential criteria for turning to the Internet, such as: anonymity, for accessing potentially embarrassing health information (Boyar, Levine, & Zensius, 2011, pp. 25-26) or to avoid the socially awkward act of asking questions and possible embarrassment from revealing knowledge gaps (Meyers, Fisher, & Marcoux, 2009, p. 325); uniqueness, for finding information not in books (Large & Beheshti, 2000, p. 1075); fewer limits, in comparison to the finiteness of books (Ng & Gunstone, 2002, pp. 498-499); usefulness (Jones, 2002, p. 283); currency (Ng & Gunstone, 2002, p. 499; Large & Beheshti, 2000, p. 1075); enjoyability (Jones 2002, p. 284); speed, accessibility, and timeliness (Jones, 2002.; Ng & Gunstone, 2002, p. 499); convenience (Agosto, 2002a; 2002b; Bilal, 2005, p. 202; Large & Beheshti, 2000; Gray et al., 2005; Fidel et al., 1999); comprehensiveness, in terms of covering topics with which books do not deal (Fidel et al., 1999; Large & Beheshti, 2000, p. 1075); and diversity in perspective and presentation (Fidel et al., 1999, p. 32; Eysenbach and Diepgen, 1999).

We interpret such criteria as aspects of quality, and they are the set from which we draw our understanding of how youth evaluate information online. But quality is also tied to social experiences; in particular, online space holds a particular appeal for youth because it offers them ways to explore and develop their identities not regulated and constrained by parents or other authorities. boyd (2007) identifies the increasing role of online spaces in youth socializing is partly due to traditional public spaces where youth have previously congregated becoming increasingly regulated or eliminated outright. Furthermore, youth can seek and disseminate information that is not available through traditional sources (Lankes, 2008). The youth desire for autonomy and youth preferences for alternative sources of information is part of perceptions of quality as well.

5.3 Main Criteria

5.3.1 *Topicality*

At a basic level, the first evaluation criterion, for youth and adults alike, seems to be topicality (Hirsh, 1999, p. 1279). In her study of 10 fifth-grade children in Arizona, Hirsh (1999, pp. 1273) find that topicality was overwhelmingly the major selection criteria of textual material, accounting for 49% of mentions (with the next-highest criteria being novelty, accounting for only 15% of mentions). The importance of topicality is also highlighted in the frustrations experienced by youth during the search process, such as sites with misleading titles, irrelevant material, the sheer amount and disorganization of information available on the Internet, and the inability of students to know whether they had found "all the information" (Large & Beheshti, 2000, pp. 1075, 1077). While topicality here would be the central quality criterion, we may interpret these respective frustrations as a set of supporting quality criteria: an accurate label, ease of access and visibility among search results, organization, and completeness (as well as a way to determine or verify completeness).

We can glean more details about what kind of topicality is valuable from an exploratory study Wallace, Kupperman, Krajcik, and Soloway (2000) carried out with 8 Midwestern U.S. sixth-graders in 1996. Wallace et al. find that the students of their study "look for the words they expected to find in an answer to their question" (p. 93) and that valuable sources were those that contained the given words.[13] This might also relate to ease of use as an evaluative criterion, since the closer a located piece of information is to a given question, the less effort and mental processing is required to adapt it.

5.3.2 *Cues and Heuristics*

Youth use indirect cues and heuristics to judge the quality of a site, where the cue is something observed, and the heuristic is an "evolved [generalization] stored in one's knowledge base that often gets refined with experience" by which the cue is interpreted (Sunder, 2008, p. 75). Heuristics are automatic and are different from heuristic processing, which is the conscious use of reasoning based on cues.

Metzger, Flanagin, and Medders (2010) report findings from focus group interviews with 109 individuals that show users rely on cognitive heuristics to make credibility assessments of information online. Although these findings describe adult behaviors, they are consistent with earlier research on youths' use of heuristics by Lorenzen (2001) and Sundar (2008).

One study by Lorenzen (2001) mentions several such cues, based on interviews with 25 students. Lorenzen finds that while many students were unable to answer a question about how they tell good from bad information on a Web site, with most commonly responding that they did not know (pp. 158-159), they mentioned cues they would use to filter out websites. Students reported not trusting

pornographic pages, sites with errors, or ones lacking a bibliography; they also reported distrust of .com sites, preferring .gov and .edu (pp. 158-159). They similarly distrusted sites with spelling errors, although some U.S. students identified sites as having errors that were actually using British spellings and were not incorrect (p. 160). If a site were archived in the directory of a search engine, it was taken as a positive cue (pp. 160-161). Cues are not an evaluation of information itself; indeed, Lorenzen critiques the students' use of such cues as not sufficient to guarantee quality (and for some cues, such as visual cues, neither necessary nor sufficient). However, using cues and heuristics is an important—and not necessarily illegitimate or ineffective—part of an evaluation process (e.g., Harris, 2008, p. 167), and it can be unrealistic to expect youth not to use them (Sundar, 2008, p. 76).

Sundar (2008) reports on theory about youth heuristics associated with digital media, developed during "ten years of research at The Media Effects Research Laboratory at Penn State University with a variety of digital media." The project "identified four broad affordances that have shown significant psychological effects—Modality (M), Agency (A), Interactivity (I), and Navigability (N)," where an affordance is defined as a "particular capability possessed by the medium to facilitate a certain action... suggestive and perceived by the user" (pp. 78-79). In this "MAIN" model, "a given affordance (such as interactivity in an e-commerce site) conveys a certain cue (e.g., invitation to have a live chat with a customer-service agent) that triggers a heuristic (e.g., service) leading to an automatic deduction that good service means good quality of information and information supply, thus imbuing a high level of credibility to the site" (p. 79).

Interestingly, quality is seen not as the final interpretation of the information, but as a temporary step towards what we interpret as ultimately a proxy for quality, credibility. Still, taking the third step of the model as the endpoint, the MAIN model suggests some interesting criteria: it interprets the affordance of modality in cues such as "perceptual bandwidth," leading to heuristics such as "realism, old-media, being there, distraction, bells & whistles, coolness, novelty, intrusiveness" (p. 91); the affordance of agency in cues such as "collaborative filtering," leading to heuristics such as "machine, bandwagon, authority, social presence, helper, identity"; the affordance of interactivity in cues such as "customization," leading to heuristics such as "interaction, activity, responsiveness, choice, control, telepresence, flow, contingency, similarity"; the affordance of navigatability in cues such as "information scent," leading to heuristics such as "browsing, elaboration, scaffolding, play, prominence, similarity." The set of heuristics associated with each affordance all lead to a list of quality criteria: "utility, importance, relevance, believability, popularity, pedigree, completeness, level of detail, variety, clarity, understandability, appearance, affect, accessibility, conciseness, locatability, representative quality, consistency, compatibility, reliability, trustworthiness, uniqueness, timeliness, objectivity, expertise, benevolence" (Sundar, 2008, p. 91).

5.3.3 *Visual and Interactive Elements*

Perhaps the most important cue for youth is that of visual and interactive elements (Sundar, 2008, p. 76). As discussed earlier in Section 4.2.3, a number of studies (Agosto, 2002a; 2002b; 2004b; Bilal, 1999; 2004; Erstad, Gilje and de Lange, 2007; Hirsh, 1999; Fidel et al., 1999; Kafai & Bates, 1997; Large & Beheshti, 2005; Jacobson & Ignacio, 1997) show that design and multimedia play a large role in online information-seeking behavior, and further studies comment specifically on the role of visuals in evaluating sites positively. In an intervention study with 82 Dutch fifth graders and four teachers, Kuiper, Volman, and Terwel (2008, p. 686) find that the appearance of a website was an aspect all students mentioned, whether positively (such as liking pictures) or negatively. Agosto (2001) studied female youths' design preferences, asking participants how they evaluated a set of preselected websites, and concluded, "the importance of Web site multimedia quality and quantity to young women cannot be overstated"(p. 321).[14]

Why do young web searchers show a preference for visual and interactive elements? The implicit quality evaluation may lie in the *usability* of information with attractive visual elements and interactivity. Sites with large blocks of text can subject youth to "textual overload" and associated feelings of anxiety, and youth may find sites without engaging material to be "boring" and hence difficult to work with, as participants in Agosto's (2002a, p. 22) study expressed. Youth are attracted to information that is visual and visually organized because it may be easier to process and navigate at earlier stages of cognitive development. Bilal's (2002c; 2003) study, in which she had 11 seventh-graders design the type of interface they would like to see of a search engine, highlights that youth articulate definite preferences for certain visual organizations when given the opportunity. And a study by Rose, Rose, and Blodgett (2009, p. 12) of 162 students, split between seven- to nine-year-olds and ten- to twelve-year-olds, suggests the importance of graphics diminishing in the older age cohort. They found that the younger students were far more successful at completing given online search tasks with a visual navigational aid than with a content list as a navigational aid, an effect not observed among the older students. If this is what is driving youth preferences, we infer that reflexive adaptations to cognitive constraints guide youth preferences for visual organization of information. Young users are making conscious choices and are not merely attracted to or distracted by flashy graphics, although distraction is also an issue about which young users complain; see "distraction" in Section 4.4.2 above.

As we discussed in Section 4.2.3, though visual and interactive elements play a role in performing searches, young people also search *for* visual and interactive content. Parallel to this concern, while multimedia can play a role in evaluating information (as cues for quality), it is also a type of information

in itself that young users evaluate. This is not simply a matter of 'data quality,' such as the resolution and clarity of photos or videos (on which Agosto, 2002b, p. 326, did find her subjects commenting), nor is it applicable only to non-academic concerns. For example, Agosto (2002b) also finds that the student subjects in her study made "analysis of the level of detail in scientific and technological drawings" (p. 326). In addition to scientific pictures, there are photographs and videos with deep political relevance, data graphs (e.g., for which choices of scaling and a 'break' in the y-axis can make a miniscule difference look significant) and info graphics, and then there is content that has previously been on TV and in magazines (and has been a major focus of media literacy, which also has for years critiqued the lack of such content being considered appropriate to be critically studied in school settings; see Buckingham, 2003b). Livingstone, Van Couvering, and Thumim (2008, p. 107) argue that concerns that have previously been separated between media literacy and information literacy are converging, as media content is increasingly delivered online and computers contain more and more media content, including advertisements woven into information. They call for research to reflect this and to include the phenomenon of users creating media or information (pp. 103, 115).

Several studies interpret young users' preference for volume of visuals or text (e.g., Hirsh, 1999, p. 1272; Agosto, 2002b, p. 338; see also Shenton & Dixon, 2004, p. 193) and do not consider how youth might evaluate the content of visuals. For example, Walraven, Brand-Gruwel, and Boshuizen (2009) find that the 23 Dutch students in their study evaluated information through scanning rather than processing, suggesting that the appearance of visual elements, and not their content, suffices for quality. While there is no guarantee that youth will distinguish visuals as information objects,[15] there is some evidence that youth do see graphics and multimedia not just as indicators or determinants of overall quality, but as information objects in themselves. Fifth graders evaluate graphic Web content primarily by how "interesting" it is, and next by "clarity" and "completeness," whereas textual Web content is evaluated primarily by topicality (Hirsh, 1999, p. 1281), revealing an implicit distinction between textual and graphical content. And Agosto (2002b, p. 325) finds that the high school students in her study, while focusing primarily on the amount of graphic and multimedia content, did have a concept of the quality of that graphic and multimedia content and made judgments about it.

5.3.4 Judgments of 'Objective' Qualities

Our theoretical position (see Section 2) is that information (in the semantic and pragmatic sense of the term) does not intrinsically have objective qualities, and that criteria such as accuracy and correctness are only meaningful relative to a reference point. Still, youth do sometimes make evaluations that correspond to what in the adult frame are taken for granted as 'objective' qualities of information. Early

on in cognitive development, youth show an awareness of depth, comprehensiveness and completeness and use them as evaluation criteria for online material. Fifth graders can critique the depth of information (Hirsh, 1999), and sixth graders can distinguish between materials geared toward youth and those geared toward adults (Large and Beheshti, 2000, p. 1075), although not all students see the greater depth and complexity of adult material as a good quality.

While fifth graders do not show any awareness of accuracy (Hirsh, 1999), high school students (Agosto, 2002b, p. 316) are sensitive to the possibility of incorrect information and will negatively evaluate sites they suspect to be inaccurate. A large-scale study similarly shows youth similarly aligning to adult criteria as they grow older: Livingstone, Haddon, Görzig, & Ólafsson (2011), sampling 25,142 Internet-using nine- to sixteen-years-olds across 25 European countries, find that 57% of boys and 63% of girls ages eleven to twelve do not "compare different websites to decide if the information is true," versus 36% of boys and 38% of girls ages thirteen to sixteen (p. 27).

5.4 Variables

Parallel to our consideration of variables in Section 4.3, here we consider contextual and demographic variables that will specify how particular groups of youth and youth in particular circumstances will make evaluations.

5.4.1 Motivation and Purpose of Search

As discussed in Section 4, the purpose of a search can result in different search and evaluation patterns, primarily through its effect on motivation (which some, e.g. Metzger, 2007, argue is the most important variable). The two main values for the variable of purpose are academic purposes and personal or social purposes; so long as youth see queries as "imposed," such as those of school assignments, they will be more resistant to honestly and fully engage in evaluation than for the "self-generated" searches relating to leisure or other personal interest (Agosto, 2001; Gross, 1999, p. 518). An example where increased motivation led to changed evaluation was a study in which students wrote annotated citations that they would then post on a website to share with other students worldwide (Kafai & Bates, 1997).

The phenomenon of "satisficing," which is when unmotivated youth decide that information is "good enough" (Agosto, 2002b; Meyers, 2009) represents not only a "stop rule" for information seeking (Agosto, 2002b, p. 21-25), but also a shift of evaluation criteria. Youth will lower evaluative thresholds until they match the available information, rather than finding information to match set evaluation criteria. Or, in other words, youth are not "lowering" evaluative thresholds so much as changing relative weightings between evaluative criteria, in this case privileging the criteria of accessibility and

convenience; a youth will (implicitly) evaluate as "high quality" whatever information is immediately available to her or him.

We discussed in Section 4 how youth can use social processes of collaboration to co-opt for schoolwork the motivation they feel for personal information seeking. This has implications for evaluation as well, as collaborative evaluation will pool cognitive strategies and resources of multiple students as well as allow for dynamic feedback on individual judgments.

5.4.2 Gender

Having discussed how gender categorization affects search, we may also look at how it affects evaluation. Agosto (2001), in a series of group interviews with 33 New Jersey girls with a range of achievement levels attending hands-on leadership, science, and technology workshops, finds evaluation criteria falling into a series of five primary evaluation criteria: options for social connectivity, flexibility in navigation, inclusion of narrative context, content allowing personal identification, and the presence and concentration of graphic and multimedia content.

In a follow-up study Agosto (2004b) looked at evaluations made by girls based on expressions of "masculine" or "feminine" characteristics. Agosto based the study on the Children's Sex-Role Inventory (CSRI), based on earlier "gender schema theory" that looked at how sex-typing results from cultural definitions of maleness and femaleness (2004b, p. 246). The CSRI is a short form, the result of which rate individuals according to "masculine" and "feminine" characteristics as defined culturally and regardless of biological sex of the test-taker. Participants were asked to visit certain sites and evaluate them. Agosto (p. 256) finds the most significant difference was the study participants with high feminine measures placing far more importance on the quantity and quality of visual design, versus the participants with high masculine measures placing the most importance on subject content. She concludes that among the observed group, for the high-feminine measure participants, the Internet was a primarily visual medium, whereas for the high-masculine participants, the Internet was primarily an information medium.

Interestingly, high school males seem to overall evaluate the credibility of Web sites more highly than do their female peers (Flanagin & Metzger, 2003, p. 694-695). That is, given the same set of websites, male students will give higher credibility scores than will female students. Conversely, while the gender of a Web site's creator or sponsor did not have a significant effect on user evaluations across all genders, there is a significant interaction effect where each gender more highly evaluates sites created or sponsored by the other gender. That is, females judge female sites and messages least favorably, and males judge female sites and messages most favorably (Flanagin & Metzger, 2003, p. 694-695).

5.4.3 *Age / Development*

Social and cognitive development (which are usually but not exclusively a function of age; see Fitzgerald, 1999) is one of the most important variables in how young searchers evaluate information quality, as the abilities of youth change as they grow and mature. Indeed, the nature and pace of this change is a major research topic in cognitive psychology, and changes in evaluative capacity are more explicitly researched than are changes in search behavior. While a cognitive development perspective is not always adopted by research on digital media, recent work (Eastin, 2008) has encouraged the field to move in this direction. Additional work (Meyers, Fisher, & Marcoux, 2009) encourages the field to move towards a social, and not exclusively cognitive, understanding of development.

As one example of how evaluations change with development, fourth through eighth graders are only able to explain website preferences in terms of having "lots of information" or "good information" (Kafai & Bates, 1997), whereas ninth graders are able to further identify topicality, relevance and completeness as the reasons for sites being "good" or "bad" (Jacobson & Ignacio, 1997). While this ability to articulate criteria does not necessarily mean that older children have developed different criteria for evaluation than younger ones, psychology and developmental research identifies metacognition as being a major component in effective evaluation (Fitzgerald, 1999; Kiili, Laurinen, & Marttunen, 2009), as metacognition leads to "cognitive monitoring" that helps regulate and optimize cognitive processes. As another example, Flanagin and Metzger (2010) report that, as youth get older, they become less skeptical about certain types of information found on the Internet, including health information and information relating to schoolwork (p. 40). We previously mentioned two other examples of differences in evaluation among youth of different ages: as they develop, youth prefer material geared towards adults to material made specifically for youth (Large and Beheshti, 2000, p. 1075), and older students have a concept of accuracy not held by younger students (Hirsh, 1999; Agosto, 2002b, p. 316).

Age also affects motivation: for example, ninth graders show an increased tolerance for going through large amounts of text over seventh and eighth graders (Jacobson & Ignacio, 1997).

5.4.4 *Generation and Time*

As discussed in Section 4.3, there is the possibility that populations that grow up immersed in digital media from a younger age will adopt evaluation strategies different from previous generations and populations (Palfrey & Gasser, 2008; 2011a; 2011b; Eastin, 2008, p. 37). In addition, new generations of technological tools change the manner in which youth interact with online information. However,

the absence of longitudinal studies looking at generation and time as a variable means that we do not quantitatively know what shifts have taken place. Again, looking at these broad trends as they have unfolded thus far (as in Palfrey & Gasser, 2008) is critical to developing understandings about how to best adapt policy and education, and it will be similarly necessary to pay attention to how trends change with successive generations of youth in order to continue to adapt policy and education.

5.4.5 Socio-Economic Status (SES)

Just as there are differences in search patterns between youth of different SES as discussed in Section 4.3, there may be differences in evaluative ability, especially based on levels of education. However, evaluation is not as well studied as patterns in search behavior. Some of the observations made about search pattern (see Section 4.3) have potential implications for evaluation; for example, youth of lower SES who may be more likely to look up health information online than youth of other SES (Zhao, 2008) may also evaluate online health differently, perhaps even just in comparison to available offline sources. It is possible that youth of lower SES who are less likely to use the Internet as an information medium (Peter & Valkenburg, 2006) may evaluate information differently, although to know whether or not this is true and how evaluation may be different requires investigation.

5.4.6 Race / Ethnicity

Daniels (2008) suggests a connection between racial/ethnic identity and how youth of color make both online and offline evaluations that are deepened by lived experiences of racism. Specific to digital media, Daniels raises the issue of deliberately deceptive hate sites that pose as civil rights groups. Some, like AmericanCivilRightsReview.com, are crude in design, but others, such as IHR.org (the Institute for Historical Research, a Holocaust denial organization) and martinlutherking.org (a racist and anti-Semitic site, connected to the white supremacist Stormfront.org) are more sophisticated in their more professional presentation (pp. 138-139). In fact, in analyzing traffic patterns, Daniels (p. 140) finds that "the traffic patterns for the [martinlutherking.org and the legitimate thekingcenter.org] are remarkably comparable. The patterns are so similar, in fact, that it suggests that Web users who are looking for legitimate civil rights information may very well be ending up at the cloaked white supremacist site." While Harris (2008, p. 170) reports that, her high-school students quickly catch on that something is amiss when she shows them martinlutherking.org, she also notes that the students know they are in the context of an evaluation exercise and so are predisposed to be skeptical. In contrast, in interviews and experiments conducted with "high-achieving and Internet-savvy adolescents" Daniels (pp. 140-141) finds that her subjects were unable to distinguish between cloaked sites and legitimate civil rights websites, and that the evaluation strategies they were using—looking for a .org address, looking for primary sources, looking for a legitimate-sounding press—systematically failed (respectively, by the .org address of martinlutherking.org, the apparent linking to "King's

Dissertation" that is actually an article claiming King plagiarized parts of his thesis, and a self-publication disguised under the vanity press "Free Speech Press").

Daniels does not suggest that these websites are threatening to recruit disaffected white male youth into white supremacist mindsets or organizations, or carrying out successful large-scale mobilizations—these are real possibilities, but remote ones. She believes the true threat is what she calls "epistemological vulnerability:" the potential that such messages will "change how we know what we say we know about issues that have been politically hard won, issues such as civil rights" (p. 146). But here, race/ethnicity may play a role in determining how youth evaluate such information; Daniels suggests, "youth of color may have an advantage in critically evaluating these sites. If they draw on lived experience of everyday racism and do the critical work of evaluating which individuals are creating the ideas contained in cloaked Web sites, then they may have an advantage over those steeped in the epistemology of white supremacy[16] that reinforces illiteracy about racism" (pp. 147-148). However, it is an open question how much this might hold across populations of youth of color, and how many may actually be equally or more susceptible because of the overall experience of youth of color being one of "having their own cultures and histories distorted in the retelling" (pp. 147-148) and having the legitimacy of their lived experience, including the relevance of their lived experience for school purposes, denied.

5.4.7 Skill

Because of the diversity of evaluative criteria youth employ, skill in evaluation is a relativistic measure. For example, youth who prioritize credibility will evaluate an information source differently than youth who prioritize accessibility, and one who is skilled in a given evaluation process may lack skills in another. Users may also employ differing evaluative strategies depending on their skill set.[17]

Flanagin and Metzger (2010) measured students' self-perception of their own Internet skills and find that youth reporting higher technical Internet skills (i.e. operational) use an analytical strategy to evaluate a site's credibility, wherein they scrutinize author and source, a strategy demanding high effort. These same students pay less attention to site design in their evaluation (p. 53). Other students rely on group-based credibility assessments, gauging a site's credibility based on the advice of others. These students also possess higher technical skill, but demonstrated different personality traits than the more analytical students (p. 54).

In their assessment of 23 Dutch youths' evaluation strategies and abilities, Walraven, Brand-Gruwel, and Boshuizen (2009) report large standard deviations among youths' evaluation skills, indicating that personal ability affects evaluation.

Flanagin and Metzger (2010) also measure how parents perceive youth credibility assessment skill relative to their own, and how youth perceive their own skill relative to their parents. They find that both youth and parents perceive that young people's skill increases as they age, steadily approaching equilibrium with their parents' skill level (pp. 56-62).

There is also evidence showing that youths' evaluations can be modulated by their own perception of their abilities. Whether aware of the relativistic nature of this evaluative criterion or not, youth make evaluations about the "usability" of information based on how difficult or advanced it is for them. The sixth graders in Large and Beheshti's (2000) study displayed differing preferences for material intended for adult or youth users, modulated by what they felt their own ability to be: more confident students perceive the material on the Internet made for adults as "upgraded" as compared to the material made for youth, while others maintain a preference for CD-ROM encyclopedias made specifically for youth. The high school students in Agosto's (2002b, p. 317) study reported "difficulty of content" as a secondary evaluation criteria, after graphics and multimedia, which is likely an implicit comparison of the difficulty of content as compared to the youths' own ability.

5.4.8 Collaborative Evaluation

Accompanying searching through networks of friends (see "Networks of Friends" in Section 4.3) may be collaborative evaluations. Indeed, accepting the recommendations of others and passing on recommendations for finding information is, interpreted differently, accepting and sharing *evaluations* about the quality of a source. For example, Meyers et al. (2009, p. 313) find that some youth take recommendations from peers and have parents vet sites, demonstrating collaborative evaluation (p. 317).

When it comes to accepting the evaluations of others or making such collaborative evaluations, Meyers et al. (2009) find a "vetting process that relied heavily on affective concerns, trust, and specifically the duration of relationships: longer relationships were deemed to be qualitatively better and more stable for interpersonal information-sharing" (pp. 326-327). Furthermore, they distinguished social interactions with peers from those with adults: "Personal information and needs were shared only with strong ties, and this was particularly true of information that had potentially high social costs associated (e.g., 'crushes' or relationships). Information shared with weak ties—strangers or mere acquaintances—might be logistical (directions, time, and way-finding) or of little social consequence" (pp. 326-327).

5.4.9 Individual Preferences

Beyond demographics and circumstances, a youth's own aesthetic preferences or moral convictions can be a variable. Although youth use color and design as primarily criteria for evaluating Web sites, each user has different preferred colors, fonts, and styles (Agosto, 2002b, p. 327). Furthermore, moral convictions can affect site evaluations; if a site represents a topic that conflicts with a youth's personal moral convictions, the student may even put her moral considerations before all other evaluative criteria (Agosto, 2002b, p. 328).

5.4.10 Variables Use Case: Health Information

As in the search process, the type of information youth are evaluating can affect the evaluative process. While more research is needed exploring how youth of different demographics evaluate health information differently, it is worth examining research about whether youth in general distinguish health information from other types of information.

Some research suggests that youth are relatively skeptical about health information they find online compared to other sources. A recent study by Boyar et al. (2011, p. 27) finds that online searches are judged the "most effective" source least frequently, behind family and school. In focus groups, they find participants expressing uncertainty about the sources of information found online (p. 29). These findings are consistent with an earlier survey by the Kaiser Family Foundation, which found that youth were less likely to give high evaluations to health information found online compared to that coming from doctors, parents, and even television (Kaiser Family Foundation/ Rideout, 2001). Also, while "specific websites" rank below online searches in being judged as the most effective source, about 30% of youth in the study reported visiting websites of some specific organizations (e.g. Sex, etc., Planned Parenthood). The type of health information in question, such as the potentially controversial topics of sexuality, drugs, and mental health, may change how teenagers evaluate information from the Internet versus information from traditional authority figures. A desire for autonomy and an increasing mistrust of authority may lead to online information being perceived as higher quality. As suggested by Boyar et al. (p. 5), youth in the U.S. who are in abstinence-only models of school-based sex education may trust online sources that advocate comprehensive sex education. And as discussed in Section 4.1 in the example of Erowid.org, youth who become skeptical about the accuracy of mainstream anti-drug warnings may evaluate information promoting possible safe drug use as higher quality.

Flanagin and Metzger (2010) report that youth are, on average, equally likely to believe information on the Internet about entertainment and health. This study surveyed 2,747 youth on their credibility assessments of different types of information online and finds that subjects were, on average, "somewhat likely" to trust both health and entertainment information (p. 36). Given these findings, Flanagin and Metzger point to the problematic consequences involved in youths' evaluation behaviors

with regard to health information. However, Flanagin and Metzger find that that youth do identify certain cues that suggest credibility in their evaluation of health information, including perceived expertise (p. 45)

5.5 Youth Deficiencies

Adult-normative, non-ethnographic literature that phrases its conclusions in terms of what youth *do not* do, including youth behavioral barriers to effective and "correct" evaluation, provides a very useful perspective and many insights. We do not list these in order to endorse them as the problems that need to be solved; these are only the problems with which existing literature has concerned itself.

5.5.1 Youth Do Not Evaluate Credibility / Accuracy / Authority

A large body of literature has argued that youth do not evaluate quality according to the adult-normative criteria of credibility, accuracy, and authority (e.g., Akin, 1998; Kafai & Bates, 1997; Hirsh, 1999; Large & Beheshti, 2000; Schacter, Chung, Gregory, & Dorr, 1998; Wallace and Kupperman, 1997; Fidel et al., 1999). Youth favor a source for its visual characteristics (Todd, 2003, p. 38) or fail to recognize the possibility of inaccurate information (Shenton, 2004, p. 193; Eastin, Shang, & Nathanson, 2006, p. 213; Hirsh, 1999, pp. 1267-1281). Youth also rely on search engine results (Lorenzen, 2001, pp. 160-161) or the occurrence of keywords as indicators of accuracy (Hirsh, 1999, p. 1267). Others have argued that, rather than miscalculating quality criteria, youth do not value credibility or authority at the same level as adults (Flanagin & Metzger, 2008, p.18; Agosto, 2002b, p. 338). Flanagin and Metzger (2010) report that 79% of the 2,747 youth surveyed think about credibility of information found online (p. 30). However, despite taking credibility issues seriously, youth may not evaluate credibility systematically or rigorously (Flanagin & Metzger, 2010, p. 80).

5.5.2 Youth Too Easily Dissociate Message and Source

The basic assumption of the concept of "credibility" is that a user can determine the truth of a given piece of secondary information by examining the channels through which that information reaches the user. Thus, to dissociate message and source is to negate the entire premise of the credibility approach. Another fear raised in literature (Eastin et al., 2006, p. 216; Sundar 2008, p. 73) is that youth are engaging in exactly this type of dissociation. Some research suggests that dynamic presentation, exactly the type of graphic- and multimedia-intensive content preferred by youth, has a negative influence on youth recall (Eastin et al., 2006, p. 223).

5.5.3 Youth Do Not Distinguish Commercial Content

Another frequently cited deficiency is that youth do not distinguish commercial and noncommercial content. Young users have demonstrated that they unaware of the difference between paid and unpaid

results (Pew Internet/Fallows, 2005), and previous research from the broadcast media context suggests that youth do not recognize the difference between actual content and advertising (Wartella & Jennings, 2000, p. 38). In fact, sites with advertising but without an authorial attribution are evaluated as more credible (Eastin et al., 2006, p. 223), suggesting that youth not only fail to distinguish advertising but in fact misinterpret it. The majority of youth even understand the advertiser to be the source of the page where no other source was indicated (Eastin et al., 2006, p. 223).

5.6 Credibility, Adult Contexts

For all the perceived deficiencies of youth evaluation, research with adult subjects reveals that adults, in varying degrees, employ the same tactics of information quality evaluation. However, poor evaluation by youth is subject to "compounding," whereby youths' relatively limited cognitive capacity and experience aggravate the consequences of deficiencies in evaluation. This section first briefly introduces definitions and models of credibility, discusses threats that both adults and youth face, followed by articulations about how these threats are more severe for youth.

5.6.1 Credibility Definitions and Models

Major reviews of credibility literature, covering the topic from the inception of credibility literature in the 1930s, have generally arrived at the consensus that credibility is synonymous with *believability*, and that it is made up of *trustworthiness* and *expertise* (Flanagin & Metzger, 2008, p. 8; Fogg & Tseng, 1999, p. 80). As discussed earlier in Section 2.4, credibility is in some sense a *proxy for truth*, and an implicit recognition of the impossibility of directly determining truth from secondhand inputs; a piece of information not directly experienced is likely to be true if a) the source of this information is likely to know the truth (expertise) and b) is likely to not be deceptive in reporting the truth (trustworthiness).

The importance of credibility is seldom explained or stated, but understanding credibility as a proxy for truth makes the importance of credibility the same as the importance of truth. That is, having *untrue* information can have social, personal, educational, financial, or health consequences, and hence assessing credibility inaccurately can incur these consequences (Flanagin & Metzger, 2008, p. 5). [18]

While not originally perceived as such, credibility is now seen as a *relative* attribute dependent on perspective, and not an attribute inherent to a source, person or information object (Gunther, 1992; Fogg & Tseng, 1999, p. 80). However, a conception of credibility as objective and inherent may persist in information science literature (Flanagin & Metzger, 2008, p. 8).

Credibility has been systematized in various ways (Flanagin and Metzger, 2008; Fogg & Tseng, 1999). For the purposes of this paper, we consider two types of credibility: *tabulated*, which is the credibility

emerging from peer rating systems, and *emergent*, which is credibility created by individuals coordinating with one another through group and social engagement (Flanagin & Metzger, 2008). Wikis and social networking sites are examples of emergent credibility. This emergent credibility is a unique feature of digital media, which allows for "the uncoupling of credibility and authority in a way never before possible... [this] calls into question our conception of authority as a centralized, impenetrable, and singularly accurate and moves information consumers from a model of single authority based on hierarchy to a model of multiple authorities based on networks of peers" (Flanagin and Metzger, 2008, p. 17).

5.6.2 Adult Vulnerability

As the literature argues, adults have as great a need to perform accurate credibility assessments as young users. For any individual, "assessing credibility *in*accurately"—in other words, assessing likelihood of truth inaccurately—"can have serious social, personal, educational, relational, health and financial consequences" (Flanagin & Metzger, 2008, p. 5).

Many of the perceived shortcomings of youth are observed in adults as well. Adults overwhelmingly focus on the design of a Web page in assessing credibility, commenting on it 46.1% of the time, far above the next few most commonly assessed qualities of information design/structure (28.5%), information focus (25.1%), company motive (15.5%), and (despite this criterion not corresponding to any model of credibility) "usefulness of information" (14.8%) (Fogg et al., 2003, p. 5). For health information, while adults claim to be evaluating credibility by the source of the information, in some direct observational research, no subject participants checked "about us" statements, disclaimers, or disclosure statements; focus was mostly on the professional look of the design, a scientific and official look, and ease of use. Furthermore, adults were also guilty of dissociation: afterward, participants could only recall the company or organization from which a piece of information originated 20.9% of the time, and recalled even the category (government, public, university, commercial, etc) only 23.2% of the time (Eysenbach & Köhler, 2002b, p. 573). Indeed, dissociation might be an inherent feature of Internet-based media, based on the tendency of the Internet to multiply the layers through which information is transmitted (Sundar, 2008, p. 73).

Findings of the prevalence of problematic evaluation methods are even more surprising when we consider studies that show that professionals, such as graduate students in library schools, or faculty and doctoral students across various disciplines, use similar approaches. Subjects at a school of library and information science seldom scroll beyond the first page (Heffron, Dillion, & Mostafa, 1996, p. 144), and faculty and doctoral students at one university "[mention] content, graphics,

organization/structure, and type of information object relatively more often than other criteria" (Rieh 2002, p. 154).

There are also concerns applying to all users, adults included, relating specifically to the digital medium. All users access information on the Internet through four layers: *infrastructure*, consisting of the hardware (including routers and protocols) that moves information as well as the organizations, such as Internet Service Providers (ISPs), that provide and maintain this hardware; *applications*, consisting of the software (such as spam filters) that mediates the exchange of information; *information services*, consisting of organizations that provide for users' information needs through applications and infrastructure, such as Google or MySpace; and the *user layer*, consisting of the individuals and groups accessing the information on the Internet. On each of these layers, especially the layers of infrastructure and information services, there are invisible mediators that users are likely unaware of but that can have enormous impact on the quality of information users receive (Lankes, 2008, pp. 104-106).

On the infrastructure level, ISPs can easily and invisibly block traffic, such that a user might not be able to tell if a desired site is down or does not exist, or is being blocked (for extensive research on this topic, see Deibert, Palfrey, Rohozinski, & Zittrain, 2008, and Deibert, Palfrey, Rohozinski, & Zittrain, 2010). This is more of an information quality issue in countries engaging in nation-wide censorship, but nonetheless, the invisibility of this layer and lack of user awareness raises the threat (even if not the reality) of abuse. There have even been a few recorded examples of attempted censorship within a country that affects users outside of the country. For example, in February 2008, an attempt to block YouTube by the Pakistan Telecommunications Authority (PTA) within Pakistan inadvertently blocked access to YouTube for two-thirds of Internet users for two hours (Brown, 2008; Beijnum, 2008). Furthermore, most users are unaware that information is transmitted through huge networks of fiber-optic cables laid under oceans and other large bodies of water; while increasing redundancy in connectivity makes the risk of communication breakdown on this level less likely, there have still been recent examples, such as in Vietnam in 2007 (Khan, 2007), where a broken fiber-optic cable made the Internet inaccessible to large numbers of users. Iran, as well, relies on physical infrastructural routes to control information transmission on the Internet, choosing for example to route traffic through Turkey and the United Arab Emirates and not through Pakistan (Cowie, 2010).

On the level of information services, to take one example, a major threat to information quality is search engine bias (see, e.g., Gasser, 2006, p. 156). Studies find that the algorithms of widely-used search engines (including Google) show predilection toward existing websites or show other biases (Cho & Roy, 2004; Mowshowitz & Kawaguchi, 2002, 2005; Azzopardi & Owens, 2009). This raises

the possibility that users may never discover high-quality websites that are most useful for a given purpose (see also Pariser, 2011). The relative lack of competition among search engines and strong network effects may represent a trend as troubling as media consolidation, yet it is an issue that many adults as much as youth seem to have not yet noticed (Mowshowitz & Kawaguchi, 2002, p. 58). This is an issue that goes beyond youth ability to use search engines.

In some cases, the online context may make advertising more difficult for adults to distinguish as well; in 1999, a scandal emerged surrounding "DrKoop.com," a health portal partly owned by former US Surgeon General Everett Koop. The site did not distinguish between editorial content and promotion: for example, it did not disclose that listings of "the most innovative [hospitals] across the country" were actually paid results, and it called advertisers "partners" (Eysenbach, 2000; Eysenbach, 2008, p. 128). While it is unclear if this example is unique to the Internet, as DrKoop.com even violated the medical ethics guidelines of the American Medical Association in making money from referrals without disclosure, part of the concern seemed to stem from a comparative lack of proper regulation on the Internet and a lack of a code of ethics specifically for health Web sites.

At the most abstract level, the Internet presents an "information self-sufficiency paradox" (Lankes, 2008): "end users are becoming more responsible for making information determinations, but because they have fewer physical cues to work with, they are becoming more dependent on the information provided to them by others" (Lankes, 2008, p. 103). This increased dependency, and possible sources of vulnerability, cuts across the four layers through which users access information on the Web, and the variety, invisibility, and power of these various mediating forces raise the stakes for the need for credibility assessments.

5.6.3 Fears of Compounding Vulnerabilities

While youth and adults may face similar dangers, certain characteristics of youth make them seem especially vulnerable to such dangers. Young users are at an earlier stage of cognitive and social development compared to adult users, leading stakeholders to fear that youth are less able to keep track of relationships among Web pages as they navigate and hence less able to make effective evaluations (Eastin et al., 2006, p. 213). Young people are also immersed in digital media in numbers, at an early age and in a manner that is unprecedented (Flanagin & Metzger, 2008, pp. 6, 15; Pew Internet/Lenhart, Madden, & Hitlin, 2005). Stakeholders are concerned that youth will not have the pre-digital evaluation skills adults have been able to adapt to the digital context, and that the digital context will not provide sufficient ability to develop such tools from scratch, or simply that immersed youth will encounter dangers more often than adults and hence will have vastly greater chances of being negatively affected (Flanagin & Metzger, 2008). The literature shows a tension between this

view and the view that youth are less vulnerable because of the experience they gain from immersion; as Flanagin & Metzger (2008) summarize:

> On the one hand, those who have literally grown up in an environment saturated with digital media technologies may be highly skilled in their use of technologies to access, consume, and generate information. This view suggests that in light of their special relationship to digital tools, youth are especially well positioned to navigate the complex media environments successfully. On the other hand, youth can be viewed as inhibited, in terms of their cognitive and emotional development, life experiences, and familiarity with the media apparatus. This perspective suggests that although youth are talented and comfortable users of technology, they may lack crucial tools and abilities that enable them to seek and consume information effectively (p.6).

Researcher pay the most attention to the comparative lack of life experiences and background knowledge among youth, which leads to fears that youth will be less able to sufficiently evaluate credibility and quality online (Flanagin & Metzger, 2008, p. 15; Eastin et al., 2006, p. 211; Fidel et al., 1999, p. 34). Indeed, Harouni (2009, p. 487) identifies a paradox where, in order to be able to evaluate sources relating to a new topic, students must already know something about the topic.

Harris (2008) writes about how youth in her class are able to identify a satirical site, in this case, a spoof of the World Trade Organization, only with great difficulty, and even then are unable to comprehend the purpose of the satire; "they recognize the errant navigational cues but cannot decode the intellectual cues" (p. 164). Youth are seen as especially lacking in experience with health problems, and hence particularly vulnerable when it comes to health information (Eysenbach, 2008, p. 124). Fears are raised about youth improperly evaluating sites that are purposefully deceptive, such as websites of a holocaust denial organization or white supremacist organizations (Harris, 2008, pp. 169, 170).

While the lack of youth experience and background knowledge is not unique to the digital context, what exacerbates adult fears about youth victimization online is the perceived shifting power dynamics, where youth no longer have supervision they had in pre-digital contexts. Pre-Internet published information usually had to pass editing processes vetting what was publicly released and screening out information failing to meet certain standards of quality. Furthermore, pre-Internet production and dissemination costs served as a kind of market regulation (Metzger, 2007, p. 2078), where costs would enforce selection in favor of the highest-quality information (even if such a system privileges quantifiable market value as a determinant of "high-quality"). But now, "gatekeepers"—both

adults in general as well as professional editorial processes—are absent, and the burden of information evaluation falls on the individual as never before (Flanagin & Metzger, 2008, p. 12; Sundar, 2008, p. 73).

Even information that was accurate and timely in its initial presentation can degrade without proper monitoring. The digital context makes information far too easy to copy and repost. Even if the original website has a webmaster to monitor and update information on the site, reposts can be spread after they are no longer valid, and even changed as they are copied. This is especially frightening for health information, which "has a particularly short half-life and needs to be continuously updated in order not to lose its value and validity" (Eysenbach, 2008, p. 128).

The digital context might even necessitate changing our entire model of intermediaries; instead of *inter*mediaries that stand "between," the Internet consists more of what may be called *apo*mediaries who "stand by" as guides whose direction and advice is optional (Eysenbach, 2008, pp. 129-130); for youth, this multiplies the difficulty of assessment by adding another dimension, that of the apomediary, to evaluate.

Related to the lack of gatekeepers is the breakdown of authority. Youth have been "historically subject to a high degree of systematic and institutional control" (Ito et al, 2008, p. *ix*). However, the removal of intermediaries also means the removal of authority and control. Not only do youth have access to unvetted and uncontrolled information and they have the ability to become authorities and experts in their own right, in some cases with more authority or credibility than adults (Flanagin & Metzger, 2008, p. 16). The authority and expertise attributed to "digital natives" versus "digital immigrants" (Palfrey and Gasser, 2008) in domains such as social networking and new media is a perfect illustration of this. Leaving aside possible positive impacts of such leveling for youth, this breakdown of authority means that youth who might have previously looked to authority for delivering high-quality information will now have to find such information themselves.

While youth can and should try to determine authority, such as that of various apomediaries, such a determination becomes part of a larger quality evaluation process instead of the shortcut provided by the "authoritarian" type of authority that simplifies the information search and evaluation process by removing choice (Lankes, 2008, pp. 106-107). In the absence of automatic authority conferred by age or the status of parent or teacher, adults may adopt alternative approaches such as a "reliability approach," which is reliance on judgments of dependability and consistency in quality to determine what is "authoritative" (Lankes, 2008, pp. 106-7, 109). Without background knowledge, it is difficult for young users to evaluate whether a source of information is consistently reliable.

Youth appear to treat information differently depending on the media (Large & Beheshti, 2000; Flanagin & Metzger, 2008). From a survey of 2,747 youth, Flanagin and Metzger (2008) report that, for news information, youth trust television media the most, then newspapers followed by the Internet. At the same time, youth report that the Internet is the most reliable source of information for schoolwork, even more than books.

5.6.4 Encouraging Signs

Despite the many fears raised in literature about threats to youth safety posed by their poor evaluation of information quality, the literature also cites encouraging signs. First, there is not such a large gap between how adults and youth evaluate information; adults make similar "errors." While this does not lessen the danger of various threats, it does mean that youth are perhaps not any more vulnerable and can handle themselves at least as well as adults. Second, there are youth who express awareness and sophistication when it comes to information evaluation. Third, immersion of youth in digital media may lead to youth adapting and being *more*, not less, able than adults to make effective evaluations in the Web context (Flanagin & Metzger, 2008, p. 16).[19]

6. INFORMATION CREATION

We are interested in content creation because youths' creative activities are relevant to the academic context. In this section, and in this literature review as a whole, we consider how such activity in the social and personal contexts can be applied to the academic context. To explore this relation, we view content creation activities according to the spectrum of interactivity and Ito et. al.'s (2010) "genres of participation," both introduced in Section 1.3. The former framework allows us to distinguish between relatively passive activities, interactive activities, and highly creative activities; the latter two constitute information creation and dissemination for our purposes. Genres of participation provide a framework with which youth group their own online activities, enabling us to distinguish more ethnographically between the social, personal, and academic contexts.

We define creation as all acts, no matter how small, through which youth create new information objects. Besides obvious creative acts such as original art, videos, and fan-fiction, we also classify activity on social networking sites as a type of creation. For example, a MySpace or Facebook wall post might not seem like much of an act of creation, but if we consider how that brief message is both on display for invisible audiences and has a persistent online presence (boyd, 2008), its performative and hence creative nature becomes clear. Furthermore, successive wall-posts can become narratives in themselves (e.g., http://www.collegehumor.com/tag:i-found-something-funny-online/articles). Palfrey

and Gasser (2008) distinguish between the routine acts of creation necessarily involved in social media, such as updating one's profile on Facebook, and the remarkably expressive creations associated with, for example, remixing. Palfrey and Gasser offer creativity as a "differentiating term that has a qualitative connotation" (2008, p. 113). This distinction between creation and creativity is significant because, although nearly all youth create some content on the Internet, only a minority produce highly creative works. Although routine creation and highly creative creation cannot be conflated, educators and can seek to bridge these activities. From an education perspective, then, channeling the creative impulses of youth through the outlets afforded by the Internet provides opportunity for highly creative forms of learning.

Dissemination of information also relates closely to creation. For example, a youth publicly linking herself to certain types of information contributes to creating and performing an identity. Social media has facilitated the dissemination of information, where users will "push" information on to one another. The information one pushes out reflects on one's identity and interests, thus becoming part of how youth can construct and create their images in online spaces. For youth engaged in highly creative activities, social media provides new opportunities for the dissemination of user created content. (for a similar discussion, see Buckingham, 2005, p. 24).

Much of the content creation we examine breaks down divisions between contexts. Bloggers are motivated by personal factors such as self-reflection and documenting personal growth (Stern, 2008, p. 102-3), but such reflection and documentation takes place in a highly public and interactive medium (Stern, 2008). Black's (2005) description of the personal expression and community collaboration of online fanfiction communities shows fanfiction is also a mesh of the social and personal. Just as the social and personal contexts often intersect in youth content creation, so too might educators adopt the norms central to youth creative culture and blur the boundaries of the academic context.

Participation in content creation online can come to bear on topics that run the gamut of youth experiences, from academic topics to social development. For example, some research has covered topics such as youths' search for health information, gaming's relation to "media violence," civic participation through online communication, the consumption of online news and journalism, and online social interactions concerning race, class, and gender relations (Ito et al., 2010; Nakamura, 2002; 2007; Nakamura & Chow-White, 2011). Moreover, Ito et al. (2010) point out that ideally, education should not primarily prepare youth for jobs and careers, but rather, guide "youth's participation in public life more generally" (p. 3), to which online engagement is critical. Jenkins et al. (2006, p. 5) furthermore demonstrate examples of youth who achieved success through informal online learning communities in place of schools.

Youth activity online also relates to social development, building of intimacy, self-expression, and personal growth (Livingstone, 2008; Stern, 2008), which are as or more important for life than the material of conventional academic curricula. However, in the interests of ultimate pedagogical application, we do not explore youth content creation on its own terms (as do, for example, Ito et al., 2010), but look at content creation through a lens that seeks to find relevance to the academic context.

Ito et al. (2010) argue that skill is not an objective measure of youths' internal abilities, but highly contextual and relative to a particular practice or cultural referent. Likewise, the language of "skill transfer" assumes that skills are objects that are passed from educator to student, or from peer to peer. On the contrary, learning can occur in various fields of practice and interaction. To capture this complexity, we draw upon the field of *new literacies*.

6.1 New Literacies

New literacies generally refer to the constellation of communication and creation practices that take place around the Internet and digital media such as blogging and vlogging, remixing, IMing or video chatting, texting, emailing, gaming (individual, multiplayer, or MMO), writing online fanfiction, participating in forums and online communities, etc. Learning about these activities is comparable to the process of learning how to read and write.[20] Coiro, Knobel, Lankshear, and Leu (2008) distinguish different ways of defining this term: broadly, new literacies can be defined in terms of "epistemic values concerned with producing and evaluating knowledge and information pertinent to our personal, civic and professional lives," or in terms of "producing and exchanging meanings by means of encoding and decoding symbols mediated by some technology" (p. 11).

In considering new literacies as epistemic values and the production and exchange of meanings, we focus on the former, as our concern is in the relationship between practices in the personal, social, and academic contexts. By seeing new literacies in terms of an epistemic model—literacies as an approach to learning and engagement with associated skills and motivations—we can relate them to classroom activities. By treating them as such, however, we admittedly risk using new literacies as a stand-in for "skills." If we assume new literacies can be divorced from the production and exchange of meanings around which they arise—in effect, decontextualizing them—we may tacitly endorse flawed pedagogical strategies. After all, youth themselves hold new literacies to be important because they facilitate, or enable, participation in certain activities or communities, not because they are attended by certain thought processes or skills.

Nonetheless, we focus on new literacies as "skills," as our concern ultimately remains with the classroom. However, we allay some of the problems explained above by addressing the *norms* that arise around youth content creation. Norms might be standards (abbreviated writing styles for IM or text messaging), values or attitudes (support of fellow fan-fiction writers, enthusiastic participation in content creation communities), or expectations (to interact with online content by giving or receiving feedback). Norms themselves are not the production of meanings, but the consequence of such meanings. When bringing new literacies into the classroom, such norms, and educators' attempts to adapt them to the academic context, may determine whether or not skills can be developed into the classroom.

We begin by examining youth online activity. What is the landscape of youth information creation and dissemination online? Next, we look at what skills youth acquire in the process of going through these activities. Lastly, we see how norms from one type of creation and dissemination, such as social norms, might carry over to the academic context. Here we also include a discussion of potentially transferring norms of engagement by adopting applications and services from the social and personal contexts to the academic context.

6.2 Content Categories

6.2.1 Social Networking Services (SNS)

Social networking services (SNS) allow users to create a profile, link to or "friend" other users, and interact with others in the network, often by sharing messages or photos. According to a 2011 survey of 799 youth, SNS like Facebook, Myspace and Bebo are some of the most ubiquitous forms of content creation among youth, with 80% of online teens ages 12–17 participating (Pew Internet/Lenhart et al., 2011). Age and gender are factors in determining social networking participation. According to a 2007 survey of 935 youth, older teens are more likely to use SNS, with 47% of twelve- to fourteen-year-olds reporting use compared to 63% of fifteen- to seventeen-year-olds. (Pew Internet/Lenhart, Madden, Macgill, & Smith, 2007, p. 28). Girls, particularly older girls, have higher rates of SNS participation than boys, with 86% of girls fifteen to seventeen maintaining a profile, compared to 69% of boys of the same age (Pew Internet/Lenhart, 2009a, p. F5). From her ethnographic work, boyd observes that race and SES have little effect on likelihood to use SNS (boyd, 2007). In the UK, age and gender similarly determine rates of participation in social networking sites: young teens are more likely to have set up an SNS profile than younger children, with 80% of twelve- to fifteen-year-olds having done so compared to 28% of eight- to eleven-year-olds. Among twelve- to fifteen-year-olds, girls are more frequent SNS users than boys, with 85% and 76%, respectively, having reported setting up a profile (Ofcom, 2011).

Teens use SNS as a platform for interaction and communication with other users. Most teen users' networks (and audiences) consist of peers who they know in an offline context, making little discrimination between close friends and casual acquaintances when adding online contacts (boyd, 2004, 2007). Older boys are the most likely group to use SNS to flirt or interact with people they do not know, while older girls are the most likely to use it to communicate with offline friends (boyd, 2007). Profiles create an online identity intended to be well received by peers, often displaying contact information, identifying information like birth date or school, and personal interests or hobbies (boyd, 2007). Teens tend to pick up on cues about what types of information are "socially appropriate" to present by looking at others' profiles (boyd, 2007).

SNS enable rapid and frequent content creation and dissemination through a network, providing a variety of avenues for communication between users. According to a survey of 493 youth, 84% of teen social network users have posted messages to a friend's wall or page, 82% have sent private messages to a friend within the social networking system, and 61% have sent a bulletin or group message to all their friends (Pew Internet/Zickuhr, 2009). A 2008 analysis of adolescent MySpace profiles finds that 56.9% of users shared at least one photo of themselves (Hinduja & Patchin, 2008).

6.2.2 *Wikis*

Wikis are collaborative websites that allow any user to create and edit pages, with an emphasis on linking between pages. The largest is Wikipedia, an encyclopedia written entirely by its users in wiki form. In a recent survey of 176,192 Wikipedia users, 24.2% of the sampled group consisted of youth ages ten to seventeen (Glott & Ghosh, 2010). Roughly one quarter of the youth users reported contributing to Wikipedia content, defined as editing and authoring articles (Glott & Ghosh, 2010). Girls aged ten to seventeen constituted a smaller portion of contributors than boys of the same age. The most commonly cited motivations for contributing among youth were "I like the idea of sharing knowledge" and "I saw an error I wanted to fix", which reflected the same motivations cited most often amongst older age groups as well. However, the youngest users also tended to place more emphasis on gaining new skills as a motivation than older groups, and less emphasis on earning money (Glott & Ghosh, 2010).

6.2.3 *Personal Websites*

Eleven percent of teen respondents to a 2008 Pew Internet survey report having a personal website (Pew Internet/Lenhart, 2008, p. 25). Among twelve- to fifteen-year-olds in the UK, the rate of creating a personal website is 18% (Ofcom 2011). As with SNS, older girls in the fifteen to seventeen age range

are the most likely to participate in personal website creation, at 34% (Pew Internet/Lenhart et al., 2007, p. 8). Users who access the Internet daily are also more likely to participate in this behavior, at 31%, than infrequent users, at 12% (Pew Internet/Lenhart & Madden, 2005, p. 9). Experience with using the Internet also affects the likelihood of engaging in webpage creation; the more years of experience a young person has, the more likely they are to have constructed their own page (Livingstone, Bolber, & Helsper, 2005). At a rate of 34%, youth who use the Internet everyday are the most likely to have a personal website, as are girls ages 15 to 17 (Pew Internet/ Lenhart et al., 2007, pp. 7-8).

Some evidence suggests that young people who create webpages often abandon them. In a survey of 1,257 nine- to nineteen-year-olds in the UK who go online at least once a week, Livingstone, Bolber, and Helsper (2005, p. 8) find that 34% reported having created a webpage, but only 16% of that group reported that their site is still online and regularly updated.

Young people cite various motivations for creating a webpage. A 2008 survey of 500 youth by Schmitt, Dayanim, and Matthias (2008) indicated that identity assertion and exploration was a major factor, with 80% of youth website creators agreeing that their sites "help others to understand who [they] are" and 90% feeling that "they can make it [their] own way." Other motivations include schoolwork (45%, with girls citing this more often than boys) and wanting to improve Web design skills (19%, with boys citing this more often than girls) (Livingstone, Bolber & Helsper, 2005).

6.2.4 Blogs

Blogs are essentially self-published chronological online journals, where the user makes posts containing commentary, links, and other media content. The number of teen bloggers appears to be in decline. In 2007, 28% of teens had their own online journal or blog (Pew Internet/Lenhart et al., 2007) but by 2009, only 14% of teens reported that they blogged (Pew Internet/ Lenhart, Ling, Campbell, & Purcell, 2010). This trend is consistent with youth in the U.K., where the number of twelve- to fifteen-year-olds either actively blogging or interested in doing so has fallen, from 15% and 26% in 2009 to 12% and 18% in 2010, respectively. For British eight- to eleven-year-olds, rates of those who have set up a personal blog remain low, at 2% (Ofcom, 2011, p. 43). As with other types of digital content creation, older girls are particularly enthusiastic adopters of the technology, with 41% of fifteen- to seventeen-year-old girls keeping a blog, compared to 34% of all girls and 20% of all boys (Pew Internet/Lenhart, 2008, p. 25). Data from 2006 suggests that youth from low-income and single-parent households are more likely to blog: 35% of low-income online teens versus 24% of higher-income teens report having a blog, and 42% of online teens from single-parent households versus just 25% of teens in two-parent households (Pew Internet/Lenhart et al., 2007, p. i).

Other than posting in their own journals, youth also read and interact with their peers' blogs. Fifty-two percent of Pew Internet/Lenhart, Ling, Campbell, & Purcell (2010) respondents reported posting comments on a friend's blog. Blogs also seem to have a slightly lower rate of abandonment than other personal websites created by youth ages twelve to seventeen; 57% reported updating their blogs weekly or more (Pew Internet/Lenhart & Madden, 2005, p. 7).

For youth bloggers, blogging represents a significant outlet for writing and content creation. Among youth bloggers, 23% write outside of school about every day. Youth bloggers write more outside of school and do a wider variety of writing than non-bloggers. Youth bloggers also place a higher value in writing as a determinant of success later in life compared to other youth (Pew Internet/ Lenhart et al., 2008).

Teens often use blogs as a space to discuss topics affecting their everyday life. Pew Internet/ Lenhart et al. (2008) find that "47% of teen bloggers write for personal reasons several times a week or more" (p. 35). One sample of adolescent blogs revealed that over 70% addressed school-related topics, and over half discussed relationship issues (Huffaker, 2006). The same survey revealed that teen bloggers share a significant amount of personally identifying information, and 61% provide some means of contact, usually an email address. Communication and interaction with readers and other bloggers also appears to be important to adolescents, with half linking to other blogs and 67% offering a comments section for readers to respond to their posts (Huffaker, 2006).

6.2.5 Self-Authored Content Sharing

Opportunities to share self-authored creative content have blossomed with the popularity of sites like YouTube, Flickr, and Deviant Art among others. According to a Pew Internet Project survey, 38% of youth ages twelve to seventeen share content online that they created, such as artwork, photos, stories and videos (Pew Internet/Lenhart, Ling, Campbell, & Purcell, 2010). These types of content creators are more likely to be from urban areas and access the Internet daily. Again, older girls are leading in this type of behavior, with 38% of girls fifteen to seventeen sharing self-authored creations compared to 29% of boys in that age group (Pew Internet/ Lenhart, & Madden 2005). Approximately half of all online teens report posting photos online, with girls participating more than boys (54% compared to 40%) (Pew Internet/Rainie, 2009a; Pew Internet/Lenhart et al., 2007). One area where boys are leading is the posting of video files on sites like YouTube; 19% of boys report this behavior, compared to 10% of girls (Pew Internet/Lenhart et al., 2007). Turning to the UK, we find well over half (61%) of British youth ages twelve to fifteen have posted photos online "at least once" (Ofcom, 2011).

Remixing and mashups represent a variation of self-authored content whereby people appropriate materials like images, music, text, and video and editing them into a new media object. According to a Pew Internet Project survey, 21% of youth participate in remixing activities (Pew Internet/Lenhart, Ling, Campbell, & Purcell, 2010).

6.2.6 *Games*

It is well known that video gaming is an extremely popular activity among youth today across all demographic sectors, with 60% of all youth ages eight to eighteen play video games (Kaiser Family Foundation/Rideout, Roberts, & Foerh, 2010). The amount of time youth spend playing video games has increased over time, from 24 minutes on average in 2004 to 1 hour and 13 minutes in 2009. Boys play video games on average for 1 hours and 37 minutes per day and girls for 49 minutes per day. By ethnicity, Hispanic youth playing an average of 1:35 per day versus 1:25 for black youth and 56 minutes for white youth (Kaiser Family Foundation/Rideout, Roberts, & Foerh, 2010).

Many popular types of games rely heavily on players to generate content in an open-ended gaming context. In particular, role-playing games and massively multiplayer online role-playing games (MMORPGs) require players to take on the persona of a fictional character, producing original dialogue and narrative to move the game forward, with World of Warcraft and Second Life being popular examples (Pew Internet/Lenhart et al., 2008; Byron Review, 2008). These games are very popular among young people, with youth under age eighteen making up 25% of the population of MMORPG players (Byron Review, 2008). Pew Internet/Lenhart, Arafeh, Smith, and Rankin (2008) report that 36% of youth play role-playing games; 21% play MMORPGs; and 10% play virtual worlds (the term used in this survey to encompass games like Second Life). Boys are more likely to engage in these types of content creation intensive games: 45% of boys play RPGs compared to 26% of girls, and 30% of boys play MMORPGs compared to 11% of girls (Pew Internet/Lenhart, Arafeh, Smith, & Rankin, 2008). Younger players are more likely to participate in virtual worlds, with 13% of twelve- to fourteen-year-olds reporting versus 8% of fifteen- to seventeen-year-olds (Pew Internet/Lenhart et al., 2008).

6.3 Skills

Again, viewing skills as manifestations of the "epistemic values concerned with producing and evaluating knowledge and information" (Coiro et al., 2008, p. 11), we highlight some of the skills youth may acquire as they engage in content creation and dissemination activities online.

6.3.1 *Digital Fluency and Technical Skills*

Jenkins et al. (2006, pp. 10-11) contend that playing in the digital environment—characterizing the nature of much youth online activity, rather than referring just to formal gameplay—allow youth to develop better skills in navigating "information landscapes" and making judgments about the quality of information. Content creation activities may help young people become better consumers of online content. Ito et al.'s (2010) ethnographic work finds that youth interested in how technology and media work often gain such interest pursuing various online activities. The authors use the phrase "messing around" to describe how young people broaden their skills in media and technology by exploring and experimenting on their own.

There are numerous examples of how this might happen. Creating a profile on social networking sites can introduce young people to Web page construction (Ito et al., 2010, p. 22), whether it involves original coding or what Perkel (2008) calls "copy-paste literacies" (where snippets of code are "remixed"). Then, Ito et al. (2009) describe youth who develop interests in digital media production as a result of "messing around" in photo-sharing sites such as PhotoBucket and MySpace. In the process of learning these new technical skills, young people also seek support from online resources such as search engines or interest-based chatrooms (Ito et al., 2010, p. 1). Content production activities are thus closely linked to information seeking/content consumption activities.

6.3.2 Writing and Language Skills

Youth today may be producing more texts than ever as they communicate using email, instant messaging, blogs, social networking sites, and other Web services (Pew Internet/Lenhart et al., 2008). While there is a widespread concern that the quality of writing is deteriorating as young people become lax about grammar and spelling when communicating online (Pew Internet/Lenhart et al., 2008), a growing body of literature suggests that online spaces such as blogs and fanfiction sites help youth develop language and writing skills.

Moving beyond the traditional use of computers as simple editing tools, these sites allow participants to take advantage of networked communities of readers and writers. Students who participate in networked spaces can discuss their writing with a variety of readers ranging from peers to experts throughout the writing process (Black, 2005a, p. 127). The sense of immediacy that is created by interacting with the audience in real time further motivates young people to write (Drexler, Dawson, & Ferdig, 2007, p. 140; Black, 2005a). Through such participation, students learn to write with purpose and address specific audiences (Black, 2005a, p. 127). Commenting and hyperlinking features in these sites can further serve as powerful learning tools by helping youth situate knowledge in a wider context and allowing them to build a relational understanding of knowledge and knowledge-making processes (Ferdig and Trammell, 2004). Moreover, students gain digital and visual literacy skills that are needed

in social, academic and professional contexts (Lankshear & Knobel, 2003). Writing in the context of online communities can help students develop critical, analytical and associational thinking skills (Drexler et al., 2007, p.141).

Black (2005a) finds that English language learning (ELL) students[21] were actively participating in a fanfiction site to present their stories written in English, interact with their audience, and obtain feedback on their writing and language ability. In another study that conducted a blogging collaboration between preservice teachers and third-grade students, Drexler et al. (2007, p. 140) finds that collaborative blogging was an effective way to improve students' writing and to encourage positive attitudes towards writing.

6.3.3 Social / Collaborative Skills (collaborative knowledge building, problem solving, etc.)

Recognizing that reading and writing are "dialogic meaning-making processes that are acquired and embedded in specific social contexts" (Black, 2005a, p. 120), and that the writing and language skills discussed above are social in nature, we also look specifically at social skills.

The Internet presents opportunities for youth to get involved in collaborative content creation and dissemination processes. Many online activities have social dimensions and demand group work from participants. In the genre of participation of "geeking out" (Ito et al., 2010, p. 2), many young people seek out specialized knowledge groups on the Web to develop their expertise in a particular area and build their reputation among peers. In these groups, adults and youth meet and interact on an equal footing as expert peers, sharing and building knowledge using discussion forums, mailing lists, community websites, etc. By engaging in this kind of serious play, young people may develop skills in collaborative knowledge building and group problem solving.

Lange and Ito (2010) looked into how amateur subtitlers, or "fansubbers," collaborate together to translate and subtitle anime that is distributed to a worldwide audience on the Internet. Fansub groups are comprised of people who volunteer in various capacities as translators, editors, typesetters, etc. Working on tight deadlines with a short turnaround time, fansubbers show surprising efficiency and productivity that surpass professionals (Lange & Ito, 2010; Ito et al., 2010, p. 30).

A major context for social interaction online is gaming, which has received attention from researchers as a platform for learning (Lyman, Billings, Ellinger, Finn, & Perkel, 2004; Squire, 2008; Gee, 2007a; 2007b). Researchers are actively exploring how games might teach young people technological, social and collaborative skills that are essential for the workplace and society. In a highly collaborative

process, gamers often form a complex social structure for collective action. In many networked games such as MMORPGs, social communication and interaction are integral to the game experience (Johnson et al., 2009). As a team, youth exercise decision-making and leadership skills when organizing and implementing game action plans. Players systematically organize themselves accomplish difficult tasks, such as defeating a powerful monster (Ito et al., 2010, p. 30). Digital games can be the source of establishing a strong sense of community among young people, and youth derive a sense of group membership when playing games that require collaboration with their peers (Lyman et al., 2004, p. 14). Gamer communities also form around games to facilitate the discussion of gaming experience and exchange of information. Youth interact with expert teenagers and adults around the world to share cheats, strategies, and custom modifications ("mods") (Lyman et al., 2004, p. 13).

6.4 Norms

In addition to skills, there are also the norms of information creation and dissemination. We use this term to discuss the standards, values, attitudes, and expectations that youth have in relation to content creation and dissemination. Norms emerge through the co-production of epistemic values and the production and exchange of meanings inherent to new literacies.

Enthusiasm and freedom to engage in self-directed learning are two norms of online youth writing. Online writing norms are very different in the personal and social contexts than in the academic context. Witte (2007, p. 92) describes how students can distinguish "online writing" from "boring school writing," and how a student might do volumes of the former but be completely reluctant to do any of the latter. Other authors (Read & Fisher, 2006; Black, 2005a) report similar enthusiasm among students for self-directed writing. But enthusiasm was only one norm associated with out-of-school, online writing. Witte wanted to import the enthusiasm of self-directed writing to the academic context by incorporating a blog into her classroom, but students began using it as a chat space and posting unrelated material (p. 93). For her students, a major feature of blogging was the expectation of freedom to go in any direction they desired without interference; when this expectation was not met, their enthusiasm decreased.

Peer feedback is another norm that facilitates content creation (Ito et al., 2010, pp. 2-3). Youth who learn from one another are learning from equals who "do not hold evaluative authority over one another," enabling "peer-based reciprocity" to become a norm for negotiating respect in creative endeavors (Ito et al., 2010, p. 31). As such, youth come to expect authority to be demonstrated by technical skill rather than age or institutional position (i.e., they expect authority that is authoritative versus authority that is authoritarian; Lankes, 2008, p. 106).

Online spaces provide norms in the form of standards, both technical and related to conduct. Like peer-based reciprocity mentioned above, standards of conduct are often implicit. For example, Black (2005a) reports about the lack of tolerance for flaming ("hostile and deliberately insulting feedback") in fanfiction communities (p. 126): the targets of flaming will be given support and encouragement, whereas the perpetrators will be isolated and ostracized. "Beta-reading" (Black, 2005b, p. 126) is the fanfiction community's standard for peer review—notably, the term is taken from the name for incomplete computer programs, rather than from the academic context's terms "proofreading" or "peer editing/peer review." Beta-reading involves an author seeking out beta-readers, which often results in several volunteers. Sometimes members of fanfiction communities will also offer unsolicited feedback. Beta-readers "comment on elements such as plot, characterization, grammar, spelling, and adherence to genre" (Black, 2005b, p. 126), with feedback ranging from the specific to the general. Beta-reading's emphasis on constructive criticism and encouragement (standards of conduct) and broad metrics of writing quality (technical standards) describe the standards for feedback in fanfiction communities.

The ability to act on feedback relates to another crucial norm: the ability to edit (Stern, 2008, p. 112). Most forms of communication online are editable (or at least deletable/repostable). In response to criticism and feedback, youth can change blog posts, profiles, and fanfiction, and they can upload edited videos or podcasts. This standard evokes the "Gutenberg Parenthesis" (Sauerberg, 2009): that the ease of manipulating information in the digital context in some ways has returned us to the pre-printing press days of oral culture, where stories and records were not static entities but could and did change with oral transmission.

While content creation activities often appear directly relevant to classroom practice in the eyes of educators (Alvermann, 2008, p. 10), the norms around content creation often do not match with the norms of the academic context, which can fetter attempts to bring content creation into the classroom (Witte, 2007). Facer, Sutherland, Furlong and Furlong (2001) note that a student's "*motivation for using the computer shapes the ways in which he will learn to use it*" (p. 205; emphasis original). Based on findings from a survey of 855 students of diverse backgrounds, they critique treating computer expertise as a 'transferable' skill (p. 207), as doing so fails to recognize the goals and motivations that lead youth to develop these skills. In the following section, we explore the relationships between the personal, social, and academic contexts in greater detail and consider their education.

6.4.1 Online Meanness and Bullying

Youth use creative and interactive spaces online for experimenting with forms of dialogue and identity construction (Palfrey, boyd, & Sacco, 2008, p. xiv). While youth can find safe spaces and communities online, they are also subject or witness to cruel behavior. Although the anonymity and distance of

online interactions do create opportunities for harassment and abuse (Herring, Job-Sluder, Scheckler, & Barab, 2002), most online meanness occurs between peers who know one another offline (Pew Internet/ Lenhart et al., 2011; Palfrey, boyd & Sacco, 2008, p. 93). As meanness moves online, it can be considered under the lens of information quality. Youth make choices about the information – and its intended effect – they create and share online, and therefore the decision to create mean or hurtful information has an information quality component. Likewise, as youth are subjected to mean or harassing information, they face evaluative choices about personal relevance, credibility, and consequences. Bystanders to online meanness must also decide what do with these negative information objects, such as ignore, participate, or intervene in the dissemination process. Because individuals pay more attention to information objects that are self-relevant, such as their own name or image (Turk et al., 2011), than other quality criteria, like credibility or accuracy, may be less relevant to a youth than mean information's personal relevance.

A 2011 Pew Internet Project survey of 799 teenagers finds that "88% of social media-using teens have witnessed other people be mean or cruel on social network sites" (Pew Internet/ Lenhart et al., 2011, p. 3). Twelve percent of social media-using teens report seeing cruel behavior frequently. These data suggest that meanness and cruelty are nearly ubiquitous online, at least for young people. However, youth report a positive experience overall of social networking sites, indicating that the problem is likely not inherent in the platform, nor are youth experiences of meanness limited to the Internet (Pew Internet/Lenhart et al., 2011). Meanness seems to cross online and offline boundaries fluidly (Palfrey, boyd, & Sacco, 2008, p. 39). One quarter of social media-using youth report that an experience on a social network site resulted in an in-person conflict with somebody, 13% have felt nervous about going to school after an online experience of meanness, and 8% have physically fought with someone because of something that happened on a social network site (Pew Internet/ Lenhart et al., 2011, p. 5).

That meanness is a common experience for youth both online and offline does not make it less problematic. Ybarra and Wolack (2007) find that cyberbullying and harassment are associated with other psychological problems, such as depression, and harmful behaviors, such as substance abuse (as cited in Palfrey, boyd, & Sacco, 2008, p. 21). Additionally, Ybarra and Wolack (2007) find that victims of online meanness and harassment are more like to harass others online and be victims of bullying offline, indicating a vicious cycle (as cited in Palfrey, boyd, & Sacco, 2008, p. 21).

The various manifestations of online meanness and youth experiences of it are often dictated by the particular norms guiding youth interaction in that online space. It cannot be assumed that an adult-normative perspective of mean information can be used to understand norms around online meanness. Fewer adults report incidences of meanness online (Pew Internet/Lenhart et al., 2011), and adults

often conflate actually harmful behavior with other forms of normal youth interaction, such as "drama" (Marwick & boyd, 2011). Youths' responses to mean information also vary by context. Respondents to a 2011 Pew Internet Project survey report varying responses to online meanness, with 90% saying they have ignored it, 80% saying they have defended the victim, and 79% saying they have told the perpetrator to stop (Pew Internet/Lenhart et al., 2011, p. 5). These responses suggest that the same youth will make different choices about mean information at different moments.

As with other kinds of information, youth interpret and evaluate mean information differently depending on its form (e.g. visual versus textual). According to a survey of 1,092 Italian youth, the most severe acts of online meanness are visual acts: unpleasant pictures posted on social network sites, phone photos or videos of intimate scenes and of violent scenes (Menesini, Nocentini, Calussi, 2011, p. 272). Between male and female youth, however, there appears to be some difference in how youth evaluate acts of online meanness. For instance, boys are less concerned with the posting of photos or videos of intimate scenes than girls. Menesini, Nocentini, and Calussi (2011) hypothesize that, for boys, being the subject of this sort of sharing intimate visual information "can be considered a less severe situation because these characteristics correspond to a masculine prototype" (p. 272). Therefore, what may be a very severe invasion to a female youth may be a boon to the identity construction of a male youth. As with other kinds of information, the quality of mean information varies relative to the individual, the context, and social norms.

The thematic overlap between online meanness, and kindness for that matter, and information quality stands to be developed. From the previous discussion, it is evident that youths' information creation and sharing activities are inextricable from the opportunities and possible harms of social interaction, including meanness and bullying. As long as youth create and share information via social media, they will face decisions about the social-emotional effects of information. Because youth increasingly participate in social media, the question of social-emotional quality of information warrants further research.

7. INFORMATION LEARNING AND EDUCATION

The previous sections of this paper review literature that describes how youth search for, evaluate, and create information. The following section samples literature exploring how youth *learn* these behaviors. Section 7.2 examines learning behaviors in the personal and social contexts, including games, creative activities, and virtual communities. Research in this section is primarily ethnographic,

adopting a descriptive approach to youth behavior and the informal learning that occurs outside of classroom instruction. Section 7.3 looks at a number of education interventions that study or seek to improve youths' search, evaluation, and creation behavior in the academic context. Research in this section is largely prescriptive, testing or seeking to improve youth behavior according to adult-normative standards, and pertains to *media education* and *educational technology* (including *educational gaming*). Media education is educating youth about media substantively (in the sense of critical media studies; see Buckingham, 2003, p. 37-38); and educational technology is using media and technology to teach youth about any topic.

Section 7 departs in several ways from the traditional literature review conventions. Much of the literature included here consists of small-scale intervention studies and therefore represents but a sample of information quality education, rather than a comprehensive or systematic review. This section will adopt something like a discussion format in order to put these studies in dialog with the literature previously reviewed and with our new information quality framework. It is our hope that this dialogue may inform future educational projects dealing with youth and information quality.

Note that youth can be learning *how to* search, evaluate, or create (developing skills), or they can be learning about other topics *through* searching, evaluation, and creation (applying those skills). This is potentially an imposed distinction; if a skill develops through application, it might not be easily dissociated from that application. Referring back to our discussion of norms in Section 6, we have seen that creative skills are tied in with norms and expectations. However, when moving away from description to prescription, it may be crucial to distinguish the two: Watson (2001, p. 253-255) argues that not distinguishing teaching *about* and teaching *with* technology led to a lack of clarity in UK policy for the use of technology in schools and put the curriculum under "substantial strain." Thus, where it is appropriate, we will distinguish between 'learning how to' and 'learning through' (as for an academic program that teaches the skill or the application but not both), but when discussing learning in social and personal contexts, we will usually treat them together.

As discussed in Section 1.4.1 of this paper, skill can be a moving target for educators. Educators cannot assume a universal skill level among youth, regardless of their Internet access or frequency of use (Livingstone & Helsper, 2007; Bennett, Maton, & Kervin, 2008). Sections 4, 5, and 6 of this paper reviewed research on variables that can affect a youth's Internet skill. However, given varying skill inputs, educators can endeavor to improve youths' Internet skill. The following literature in Section 7.3 deals, directly or tangentially, with education interventions aimed at Internet skill.

Interventions targeting skill are consequential because Internet skill relates to patterns of use and subsequent external results (Howard, Rainie & Jones, 2001; DiMaggio et al., 2004; Livingstone & Helsper, 2007; Hargittai & Hinnant, 2008; Zillien & Hargittai, 2009; Hargittai, 2010; Van Deursen, 2010). Moreover, higher skill is associated with how rewarding a user's online experience can be, which can in turn motivate the acquisition of more skill (DiMaggio et al., 2004). Likewise, skill deficiency can have serious consequences. Van Duerson (2010) argues that, as information becomes more quickly and easily accessible online, those lacking skills will be increasingly disadvantaged relative to others. And because skill is associated with socioeconomic status, race, gender, and education level, a negative feedback loop can reproduce digital and other inequalities (Hargittai & Hinnant, 2008).

How youth learn Internet skills, however, is not just a question of formal education. Section 7.2 will first deal with informal learning in social and personal contexts. Much of this learning occurs through creation, an activity requiring skills often learned from peers or virtual communities. In some instances, youths' skills in a particular creative endeavor are even evaluated by an online community of peers, as in the practice of "fansubbing" (Lange & Ito, 2010, p. 272). In this example, skills interact with emergent norms particular to some youths' experience of the Internet.

7.2 Learning in the Social and Personal Contexts

There is little work examining how learning around search and evaluation works in the personal context. One important source addressing this lacuna is the ethnography-based work of Ito et al. (2010), which focuses on learning with digital media that takes place outside of formal contexts (p. 150). In particular, the genre of "messing around," one of the three genres of participation introduced by Horst, Herr-Stephenson, and Robinson (2010, p. 53; discussed in Section 1.3, relates directly to learning in the personal context.

As implied by "messing around" and the sub-category of "fortuitous searching" (see Section 4.2.4), the youth in Horst et al.'s (2010) ethnographies learn through trial and error and by piecewise exploration, such as by refining search results after getting confused by initial results and by cross-referencing offline and online information (p. 57). Another pattern is using search to find websites that are resources for particular topics, then revisiting those websites directly (p. 55). While such ethnographic work does not tell how widespread such practices might be among youth, it is still an example of effective strategies developed outside of the academic context and developed through practice, strategies that are an alternative to the metacognitive machinery of searching privileged in the academic context (Horst et al., 2010, p. 55). However, although effective, such search behavior is

potentially inseparable from application to topics only of personal interest, and whether it only rises spontaneously or whether it can be encouraged is equally undetermined.

7.2.1 Learning from Parents

While 'family' is institutionalized in society as a formal structure, the type of learning that takes place from family is not formalized, standardized, or institutionalized and hence we classify such learning within the social context. While there may frequently be learning from siblings, which is similar to peer learning, it is also critical to examine learning from parents (or legal guardians, or aunts/uncles/grandparents/other domestic caretakers). Parental figures craft media spaces and family identities, and this determines media engagement as well as values and attitudes towards consumption of and participation in media (Horst, 2010 pp. 151-154).

A strong tradition of educational literature has established that parents are key in teaching basic literacy skills to children (Klauda, 2009; Pomerantz, Moorman, & Litwack, 2007; Simpkins, Davis-Kean, & Eccles, 2005). However, despite this background, there is currently no research looking at what role parents play in teaching search and evaluation skills to their children (Lange & Ito, 2010, do look at the role parents play in teaching *creation*; see below). As a substitute, we will try to apply the existing educational research along with an argument that information or media literacy skills are not just metaphorically similar to basic literacy (Hobbs & Frost, 2003, p. 330; Rosenbaum et al., 2008, p. 22; Bawden, 2001; 2008), but also have overlaps and functional similarities.

Significant research affirms the impact of parental guidance on children's literacy. Parent activity has been shown to improve motivation (Klauda, 2009; Baker, 2003; Baker & Scher, 2002; Chandler, 1999; Flora & Flora, 1999; Baker et al., 1997; Shapiro & Whitney, 1997), success (Senechal & Young, 2008; Farstrup & Samuels, 2002; Baker, Dreher & Guthrie, 2000) and voluntary reading (Baker, 2003; Braten, Lie, Andreassen & Olaussen, 1999). Students who practice reading at home and at school achieve at higher levels than students who practice reading only at school (Chandler, 1999). Developing positive early associations with reading predisposes children to more frequent and broader reading in later years (Love & Hamston, 2004; Baker, 2003; Serpell, Sonnenschein, Baker & Ganapathy, 2002) and has a subsequent benefit to reading achievement (Baker, 2003).

Certainly, basic literacy is relevant to online activity, as there is plenty of reading online. Furthermore, enthusiasm for reading online is a critical variable for the effectiveness of search and evaluation (Kuiper, Volman, & Terwel, 2008; also discussed below). While online searching and evaluating involve a number of other skills, such as selecting among search results, navigating between pages, clicking on links, processing small pieces of information, the ability to read and process large amounts

of text is still a necessity. One difference may be that there is more available online that may be of interest to some youth, such as fan fiction or the exchanges that take place through messaging (texting, IMing) and social networking sites. In particular, Black (2005b) presents an ethnographic case where fan fiction helps English language learners with both reading and writing in the English language through inspiring greater excitement and engagement.

Since home is where children spend a significant amount of their time using media, some proponents of media literacy have focused on helping parents develop their children's media literacy skills through active mediation, including making a family media plan, using media together, and discussing media content with children (Hogan, 2001, pp. 663-679; Strasburger & Wilson, 2002, pp. 368-421).

7.2.2 Learning How to Search and Evaluate / Learning Through Search and Evaluation

As discussed in Section 1.3 Horst, Herr-Stephenson, and Robinson's (2010, p. 37) genre of "hanging out" corresponds with our category of the social context. Recalling that youth see "their peers at school as their primary reference point for socializing and identity construction" (p. 38), the learning that takes place in the social context is embedded in a larger social matrix of developing and negotiating social bonds and of identity development. While patterns of learning can thus tell us a great deal about those social bonds and development of identity, here we focus on the learning in itself.

The role that Finn (2010; in Horst et al., 2010) labels the "techne-mentor" represents a notable pattern of learning in the social context. Techne-mentors are "young people who are successful in learning advanced technology skills through messing around," and they "sometimes become experts among their families, friends, teachers, and classmates" (p. 58). Finn argues that "classical adoption and diffusion models" do not describe such a role (p. 59). She discusses ethnographic cases where youth learn from personal experience, such as through figuring out how to remove a virus or use Photoshop, and then pass this knowledge to others in need of such expertise. Finn (2009, p. 60) theorizes the important characteristic of this type of relationship as being built on existing relationships, and becoming active only when the techne-mentor's peers are having problems with technology not working, rather than being a persistently active social position. Thus the relationship is ad-hoc and informal. An intervention may be as minor as making others aware of a technology, or as involved as demonstrating the technology, or even as committed as installing the technology and monitoring its status and operation. Finn observed a great deal of fluidity in this type of relationship, with students having multiple techne-mentors relying on techne-mentors in certain circumstances but acting as techne-mentors in other circumstances, potentially by passing on the knowledge gained from other techne-mentors. Finn (2010) identifies "[the] constant flow of information about technology among a

student's multitude of social networks that accounts for the fluidity of the role of techne-mentor" (p. 60).

The techne-mentor relationship is an example of peer learning, but interesting in that it is based on learning that happened first in the personal context. Also, the learning is not obvious; sharing individual pieces of information might suggest that a "techne-mentee" is dependent on the techne-mentor, receiving the proverbial fish and not really learning how to fish. But the fluidity described by Finn, where students reliant on a techne-mentor would become techne-mentors to others in other circumstances, suggests that either there are transfers of tacit knowledge about how to search and evaluate that accompany transfers of specific pieces of information, or that becoming aware of certain information encourages exploration and consequent learning in the personal context.

The techne-mentor/mentee relationship is one example of youth socialization occuring in the new social contexts of the Internet. Several studies have documented new social norms that dictate patterns of information exchange, values, and esteem hierarchies within youth communities. These norms, although closely tied to technical skill, reflect the social experience of technology and are often in tension with adult-normative expectations. For example, youth sometimes teach one another how to locate "shock videos" involving death, accidents, and torture (Horst et al., 2010, p. 47). Such mentorship will also transmit values, such as evaluation of such videos as funny, rather than repugnant. This also emphasizes the importance of recognizing the role of norms, and not seeing such informal learning just in terms of skills taught; in this case, shock videos tie into "discourse of horror" (Burn, 2008, p. 156) that Buckingham (1996, p. 40) identifies as often serving as a testing ground for teenage boys, and this dynamic is what drives this specific instance of learning.

Another example of social norm learning that may clash with the values of the academic context is when youth learn "work-arounds," attempts to "subvert institutional barriers to hanging out while in school" (Horst et al., 2010, pp. 47-48). Teenagers in one ethnographic study "regularly used proxy servers to get online at school. [The researcher] also notes that many of the kids she spoke with seemed to know which students were experts at finding available proxy servers" (pp. 47-48). Not only would youth track down experts in evading school filtering, but also, they would watch over the expert's shoulder as he or she located a proxy server and in the process learn how to search for proxy servers themselves.

An example of a very developed process of evaluation that comes out of a social process is that within the "fansubbing" community, who translate and write subtitles for otherwise untranslated Japanese Anime movies. Lange and Ito (2010, p. 276) describe fansubbers as having "ongoing debates about

what constitutes quality work, and fansub comparison sites will conduct detailed comparisons of the quality of translation, encoding, editing, and typesetting between competing groups." In such a case, learning evaluation proceeds by reflection about what defines quality and collaboratively developing quality standards. Fansubbing communities also vet the quality of the creative skills of individuals; before an individual joins the community, she or he will often have to undergo formal tests and a trial period (p. 272).

Each of these examples demonstrates norms that emerge from technology use or virtual communities, suggesting processes of socialization that shape youth's social experience of the Internet. Insofar as these norms carry over into the personal and academic contexts, they should inform prescriptive efforts and educational interventions.

7.2.3 *Learning How to Create / Learning Through Creation in the Personal Context*

In the techne-mentor relationship, there seems to be a division between the personal and social contexts; there is exploration by oneself to develop expertise and then demonstration of that expertise as a techne-mentor, but we do not see examples of exploration taking place in front of others. Creation presents a different case, where the distinction between the social and personal contexts is not as clear. Especially as creation is often involved in exploration and development of identity, ostensibly a personal quality but one in practice defined by relationships with peers, the process of learning creation blends the personal and social contexts far more than does the learning associated with searching and evaluation described above. Specifically, Lange and Ito (2010, p. 262), in ethnographies of media creators, found that such creators described themselves as "largely self-taught, even though they might also describe the help they receive from online and offline resources, peers, parents, and even teachers." The identification of creative learning exclusively with the personal context is significant as an identity performance, not as actual demonstrations of boundaries of context.

While young people do not learn to create in isolation in the personal context, creation still does involve a great deal of solo, personal activity. Inspired by seeing works by people who are non-professionals or peers, youth begin "playing around" (Lange & Ito, 2010, p. 261) with media devices. A common pattern Ito et al. (2009) describe is one where a youth does not know that a given type of creative content is possible, and upon discovering it for the first time, becomes enchanted and then attempts to create something similar on her or his own (p. 222, 262).

In attempting to replicate on their own a type of creative activity, Lange and Ito describe a process of youth experimenting with tools, and consulting a wide range of experts, guides, and tutorials in an ad-hoc manner rather than relying on something formal and structured. The inspiration to begin playing

around in these cases often comes from the engagement with specific material, and within a specific community.

Certain games offer, again in a limited way, potential for learning through creation. Ito (2009, p. 3) identifies a genre of games as tied to constructivist learning theory; these are games that invite users to create rather than simply solve given problems. For example, *SimCity* 2000 and subsequent games in the series such as *The Sims*, where players have the opportunity to design, respectively, a functioning city and a functioning household, may be treated as "quasi-educational urban-planning scenario" (Ito, 2009, p. 181). While this is not the only way in which they are used, playing them in other ways involves creativity as well. Such creativity might be in-game, such as creating scenarios of destruction rather than ones of building, or they may extend outside of the game, such as staging and recording gameplay and adding voiceovers to create a narrative. This is effectively using the animations of the game as puppets to stage theater, a genre known as "machinima" (Ito & Bittanti, 2009, pp. 202, 261). In extending out of the bounds of the game, machinima also moves into the social context, as players make machinima videos to share.

Lange and Ito (2010, p. 245) point out that the movement from one genre of participation (or, context) to another is not a linear process. In the cases they describe, youth refine the skills and abilities to develop specialization in the personal context. Yet, an ethnography of a group of youth producing hip-hop in a summer program showed that the choice to specialize in "making beats" (where "beats" are backing tracks; p. 262) came from fitting into a niche in a collaborative endeavor (p. 262), again blurring the boundaries of our categories of context when it comes to learning creation.

7.2.4 Learning How to Create / Learning Through Creation in the Social Context

As mentioned previously, machinima is one example where the works of others inspire creation in the personal context, works which creators then share and move back into the social context. Ethnographic reports by Lange and Ito (2010) and Ito and Bittanti (2010) describe examples of individuals who, introduced to the possibility of creative endeavors by others' examples, begin experimenting with creating their own content and then proceed to share their content and to join "interest-driven" (Lange & Ito, 2009, p. 16) online communities (or what Gee, 2007, p. 90, calls "affinity spaces") centered around the creation of such media. Such communities form what Jenkins et al. (2006) terms "participatory culture." Examples of creative endeavors include fanfiction (Black, 2005a, 2005b), Anime music videos (AMVs; Lange & Ito, 2010, p. 262), machinima (Ito & Bittanti, 2010, p. 224-227), and in-game content such as customized content and modding (Ito & Bittanti, 2010, p. 222).

Beyond these specific and novel creative genres, there is writing and photography that take place in a digital context. The examples of writing and photography Lange and Ito describe do not have a period of relatively solitary experimentation. Instead, learning takes place in the context of communication and interaction within a community (Lange & Ito, 2010, pp. 251-261). Examples include youth sharing photos (p. 252), creating profiles on social networking sites (pp. 255-257), and blogging for one another (pp, 280-281; Witte, 2007). Perkel (2008) examines the case of creating MySpace profiles, a process that consists of taking HTML code from elsewhere on the Internet and pasting it into one's own profile. Such copying and pasting might even lead to youth learning HTML and CSS (Lange & Ito, 2010, p. 258). It is also an example of learning of creation that began in a social context (with participants joining MySpace to communicate, and in initial customization attempts consulting heavily with peers), and then led to specialization in the personal context. But in other cases observed in the study, customization led only to "'copy and paste' literacy" (Lange & Ito, 2010, p. 256; Perkel, 2008) rather than learning more widely applicable principles such as coding skills.

Lange and Ito (2010, p. 261) describe how youth who are interested in creative production join social websites, forums, and websites geared towards specialized creation activities (such as fanfiction, anime music videos, or photo manipulation), and how such communities always had "mechanisms in place for creators to learn from one another" (p. 274). These mechanisms included hierarchies (including greater esteem for proven experts at creation), discussion forums, simple ratings, competitions, top video lists, and form feedback templates (p. 275), to having peers provide ad-hoc advice and assistance (p. 274). Lange and Ito describe all creators participating in giving and receiving feedback, and in the process improving their creative craft (p. 280).

An extended ethnographic study of a creative community is that of Black (2005b) about English-language learners (ELLs) in an online fanfiction community. Here, she observed non-native speakers of English participating in online communities that provided not just content feedback, but feedback related to formal elements of language. In other words, they were learning English through creation in the social context. Black (p. 125) notes that what are known in the academic context as proofreaders, editors, and peer reviewers are known as "beta-readers" in the fanfiction community. This unique name for a fundamental role in academic contexts suggests that at least some editing norms emerged internally within the community rather than being brought in from academic contexts. She describes authors seeking out beta-readers, posting requests on the community's website. Beta-readers, she observed, sometimes were very technically specific, such as rewriting "several paragraphs of the story to model effective use of conjunctions, subordinate clauses, and sentence transition" (p. 126), representing teaching through feedback and creation of exemplars while being non-critical and avoiding the identification of mistakes. Other cases of feedback focused on grammar and composition,

reinforced with constant positive feedback and requests for updates (Black, 2005b). Similarly, there is little tolerance for negative feedback. Black suggests that a major part of the appeal of the learning that happens in fanfiction communities is that the overwhelmingly supportive, encouraging, nonjudgmental and positive environment creates a "safe, accessible space" (Black, 2005b). But of course, beyond epistemic values, much of the appeal comes from the subject matter itself (see p. 123-125 for a discussion of this aspect)—we can identify the importance of fanfiction to the actual authors as being in the production and exchange of meaning.

The communities that form around digital media creation are not themselves always mediated through digital media. In various cases, Lange and Ito (2010) observed clubhouses, after-school and summer programs, activity centers, and community centers giving youth access to the technologies, support for learning, and the opportunity to learn from both adults and peers (e.g., pp. 45, 257-259, 270-272). Beavis, Nixon, and Atkinson (2005, p. 59) also discuss Internet cafés as locations where peers exchange knowledge. Outside of specific meeting spaces, there is the learning and mutual support that happens just among friends, such as collaboration for taking photos (p. 252) or making videos (pp. 243, 273). Online participation also sometimes leads to in-person meetings, such as AMV makers meeting at Anime conventions, to discuss their work (p. 276) and continue the feedback and learning process in-person.

Lastly, as mentioned earlier, parents can be the key figures from which youth learn to create. Parents (or legal guardians, or related domestic figures such as aunts, uncles, and grandparents) may play a role "either by providing resources; introducing kids to genres, software, or sites; or by working in collaboration with kids" (Lange & Ito, 2010, p. 263). Such parents may even have formal educational training in computers or media production.

Parental engagement, and especially the transmission of parental expertise, can instill epistemic values, but the motivation for transmitting epistemic values will lay in the production and exchange of meanings between parent and child.

7.3 Teaching in the Academic Context

Having examined how youth learn outside of school, we now examine literature discussing how youth are taught in school. The difference between *learning* and *teaching* is largely a matter of perspective: learning is the destination of the educational process, and teaching is the origin. Whereas self-learning/self-teaching does occur, in section 7.2 we employ "teaching" in the conventional sense of the teacher-student relationship.

While extant media education programs and educational technology initiatives are relevant for our investigations, keeping with the format of the literature review, we focus on programs described in literature and on existing theoretical treatments. Some individual teachers have experimented with classroom activities, and have written narrative accounts of their experiences (e.g., Witte, 2007; Harris, 2007); despite being isolated attempts that are not systematic or system-wide, they are documented and thus we include them. Conversely, we do not review system-wide programs whose only documentation will usually be internal government reports.

We also return to some studies we cited in Sections 4 and 5; as many studies involving teaching search or evaluation include observations of how youth search and evaluate, it was relevant to extract such observations from the overall framing of the studies. Here, we present the full context of the studies. However, there is not as much literature specifically on interventions as for behavior; Kuiper, Volman, and Terwel (2008), based on their experience from their 2005 literature review (Kuiper, Volman, & Terwel, 2005), conclude that, "Although there is rather ample research on both children's Web search behavior and the way the Web may be used as an educational tool, empirical research on teaching Web skills is relatively scarce and mostly aimed at upper grade and university students" (2008, p. 668).

7.3.1 *Teaching Search*

A study by de Vries, van der Meij, and Lazonder (2008) introduce a concern that is perhaps sequentially prior to any other step: fostering ownership over search questions. This concern is inspired by constructivist learning theory, which holds that personal ownership over search questions are central to motivation, perseverance, as well as the quality of subsequent problem-solving and evaluation (de Vries et al., 2008, p. 650). Specifically, de Vries et al. develop an idea of "reflexive web [sic] searching" as a model for classroom instruction. They define reflexive web searching as developing ownership of the search question, interpreting and personalizing new information while searching, and adapting the interpreted and personalized information (pp. 650-652). They carried out an intervention study with 44 small groups of 2-4 Dutch students in the fifth and sixth grades. The goal was to encourage youth to "search the web *reflectively* by comparing owned concepts, facts, and personal experiences to new information, and starting a process of mutual adaptation" (p. 650).

The study tested whether limiting the search space through having students search through a specially designed portal could help them concentrate on searching reflexively. The study found that limiting the search space did help the students locate information, but that adaptation was minimal and that students only answered 30.9% of task questions (pp. 663-664), overall concluding that reflexive searching was only partially realized (pp. 657).

Although "defining the information problem" is identified as an area of concern (see Section 5; see also Walraven et al., 2008, p. 628), there do not seem to be any intervention studies specific to youth and the Internet that deal with helping students to clarify tasks or determine needed information (Walraven et al., 2008, pp. 637, 639).

The majority of interventions focus on carrying out the search process and aim to help students at this stage. Some educational interventions may, instead of teaching strategies for narrowing the search space, provide specific tools for narrowing the search space such as a portal, a specially designed filtering program, or simply a handout listing relevant websites. The premise seems to be that existing tools are not sufficient to help students conduct searches; however, even if narrowing the search space helps students, the question remains of how teaching search through such limiting is relevant for teaching students how to conduct searches in an unlimited space. One approach addressing this is "scaffolding," where the support given to students is then gradually decreased (Hoffman, Wu, Krajcik, & Soloway, 2003, p. 327; Lazonder, 2001, p. 163). This is in effect providing 'training wheels' that are then removed.

The study by de Vries et al. (2008) described above, in addition to providing a focus on a step preliminary to carrying out the actual search, offers an example of an intervention that narrows the search space. The study sought to find whether a specially made portal consisting of a list of resources would help students with searching and completing a worksheet for writing down questions and answers. The authors found that a more manageable search space was easier to navigate, yet the long lists of websites of the portal were still overwhelming for young students (de Vries et al., 2008, p. 656). Furthermore, the worksheets did not lead to complete engagement, as students answered only 30.9% of questions with question-related information, and 61% of questions went unanswered (p. 656). The worksheets also did not lead to greater adaptation, as 75% of answers were literal (p. 657). However, the number of questions answered increased dramatically from 30.9% to 82.9% when the portal was restructured as a four-level deep hierarchy of topics and subtopics (de Vries et al., 2008, p. 661). While the study does not discuss how teaching youth to search through a tailor-made portal and a guiding worksheet will generalize, the implication is that teaching youth reflective searching is something that will carry through to non-limited search spaces.

Hoffman et al. (2003) conducted an intervention study with eight pairs of sixth-grade science students, selected to provide a diversity of gender, race, learning achievement, and "abilities to verbalize their learning process" (p. 329-330). The intervention consisted of providing a software program called Artemis that provided an interface, a research engine, topic search, and a workspace. The scaffolding was twofold: giving students intermediary goals in the search process, and giving students an overview

of the topic before having them conduct searches. The intermediary goals towards which the study and Artemis guided students were to ask questions of interest, plan their inquiry, search for information, assess findings, and create representations of newly constructed understandings (p. 329). Teachers were also part of the intervention, with the study authors providing booklets providing a process model of searching ("ask, plan, search, assess, write, and create," plus having "explore" in each step; p. 329) by which the teachers could guide students. Thus, indirectly through teacher assistance, the study included teaching students a specific process model of searching.

The type of scaffolding in the study was to provide support in searching so that students could "focus on the contents of the resource, evaluate its usefulness, and synthesize information rather than spending the majority of time simply locating appropriate sites" (Hoffman et al., 2003, p. 328). For evaluation, no models or specific assistance was given. While the study separated out "Search" and "Assess" as "separate categories of inquiry," the authors note that "these two types of strategies were used seamlessly by highly engaged students" (p. 341).

Overall, the study found that Search and Assess strategies impacted the development of content understandings, but also that Search and Assess strategies were a function of motivation and engagement rather than the independent variable. That is, the more engaged the student, the more in-depth they would explore sites and the more carefully they would evaluate the results (pp. 337-338). 70% of students with moderate to high levels of engagement developed accurate understandings with no incorrect conceptions, whereas 83% of students with low engagement developed partial understandings with some incorrect conceptions (p. 338).

Pritchard and Cartwright (2004, p. 27) advocate promoting effective searching first by having Internet sites be effectively designed for information use, and second by encouraging youth to use information sources in a way that reflects constructivist understandings of learning (p. 26). They conducted a pilot intervention study in the UK that gave 54 students ages ten and eleven a list of ten relevant websites for the purpose of completing a simple research assignment. However, they found that the quality of end products was poor, consisting mostly of small samples of information, and that there was very limited recall a few weeks later (pp. 28-29). There was little engagement with content, and, as would be predicted by constructivist learning theory, the students learned very little. Interestingly, a major problem during the task was that students spent time on "distraction activities," and would "'wander off', accessing sites that had little to do with the activity" (pp. 28-29). The study does not elaborate on the decision to provide a preselected list of ten websites, but we can guess that the study authors were interested in limiting the search space to keep the participants focused on the task. The authors concluded that in this study, "the use of the Internet was a distraction and that the quality of the

children's work has been adversely affected by it, even if the consensus of the class seemed to be that the work was enjoyable..." (p. 29).

Gerjets and Hellenthal-Schorr (2008) carried out an intervention study focusing on cognitive skills, partially as a critique of training programs that focus on technical aspects (p. 694). They synthesized several models of information retrieval and determined five sub-processes to target: "specification of information requirements, application of search strategies, handling of search systems, selection and evaluation of information and information sources, and monitoring of processes and results of information searches" (p. 696). The outcome was a web-training course, CIS-WEB (Competent Information Search in the World Wide Web).

The instructional methods of CIS-WEB are regular classroom teaching, working in pairs, individual exercises done on paper worksheets (either corrected within the pairs or through the teacher going over solutions with the whole class), sample problems with step-by-step model solutions, symbolic representations for structures like the Internet, multiple-choice questions, and post-activity paper worksheets (Gerjets & Hellenthal-Schorr, 2008, p. 701).

The study involved comparing CIS-WEB to a popular existing Internet training course, "Surfcheck-Online," designed for students by the German non-profit organization Schulen ans Netz. Surfcheck-Online involves "five chapters on Internet access, basic knowledge on the Internet, navigation, communication, and security and needs" over two lessons (p. 702). Gerjets and Hellenthal-Schorr conducted and initial control trial of Surfcheck-Online with 28 sixth-grade students in a German public high school, 21 boys, 7 girls, with an average age of 11.92 years. Almost all the students had prior experience in information retrieval over the Internet (Gerjets & Hellenthal-Schorr, 2008, pp. 703-704). From this program, knowledge gains were not statistically significant in search-relevant and search-irrelevant items, and there was no difference between unguided exploration and the skills of those who received training (p. 705).

The students who participated in the trial involving CIS-WEB were 61 German public high-school students (30 girls, 31 boys) in grades seven (30 students, average age 12.33) and eight (31 students, average age 13.30), again with almost all reporting prior experience (pp. 706, 708). As hypothesized, CIS-WEB improved declarative knowledge for both search-relevant and search-irrelevant facts.

In a study integrating Library and Information Science concerns with teaching skills and education concerns with content matter, Kuiper, Volman, and Terwel (2008) carried out an intervention study focusing on "Web searching skills, Web reading skills and Web evaluation skills" (p. 668; "Web

reading" falls under our category of search). Kuiper et al. implemented an eight-week program that practiced these skills with 82 5th graders in four schools with good ICT facilities in the Netherlands, with populations drawn from the lower and middle classes, suburban and village populations, and were comprised of a mix of white students and those from immigrant communities (pp. 670-673).

Results varied over the four schools, due to both differences in circumstances between schools and differences in teachers' experience and teaching styles. In particular, one teacher had a teacher-directed style opposed to constructivist understandings of learning (Kuiper et al., 2008, p. 680). Some common reactions from teachers were that the program was too short a time to expect results, combined with observations that over the course of 8 weeks students lost interest in the project. Teachers suggested that the course be split into several smaller courses to be taught throughout the year (p. 680), and reported that "reading skills were the most difficult to discuss with the students because of many students' dislike of reading on the Web" (p. 681). However, students enjoyed expressing their own opinions, which made teaching evaluation easier. Student reactions were generally positive, but at one school, some students felt that they had learned everything they needed to know from growing up with computers. They were therefore indifferent or resentful towards the goals of the program (p. 682).

On questionnaires, students showed an increased tendency to believe that information online was different than information in books. For the open-ended part of the questionnaire, Kuiper et al. (2008) interpret responses as tending towards critical statements, such as "books are more true" and "everyone can write anything on the Web" (p. 682).

Kuiper et al. (2008, p. 683) found that, despite discussing possibilities and limitations of using Google versus other search strategies, students did not change their search behavior and overwhelmingly relied on Google. They also reported that students used mostly scanning strategies, seldom used menus or links and sometimes "ignoring relevant headlines." In terms of evaluation, "students never questioned the reliability of a specific website. They sometimes explicitly paid attention to the usefulness of a website, but only in terms of the relevance of the information" (pp. 683-684; see also Section 5). Better-performing student pairs were characterized by patience as well as a willingness to experiment with strategies, as opposed to "weaker performing students [who] tended to stay at one strategy they thought useful" (p. 685), sometimes to the point of stubbornly adhering to a strategy that was not working.

In general, Kuiper et al. (2008) concluded that integrating "Web literacy" skills and content knowledge was successful, but other lessons from the study were perhaps more enlightening. The study pays a great deal of attention to the variable of the teacher, noting how much of the differences in results

could be attributed to the distinct enthusiasm of two teachers versus the lack of enthusiasm of another. The study also found that an important variable associated with higher-performing students was patience, especially when it came to having the patience to read through more content on websites, and the authors suggest stronger support specifically for weaker readers (p. 689).

Kuiper et al. (2008, pp. 689-699) also stress how the study participants remained inconsistent Internet users, often demonstrating knowledge skills but failing to act on them. They speculate that this discrepancy comes from students learning to use the Internet at home, where random surfing and trial and error are appropriate for their needs. They use these practiced patterns even when taught skills that are more appropriate for the knowledge construction of the academic context, which requires "more attention on general inquiry or meta-cognitive skills like planning, monitoring and reflecting skills" (p. 690). Kuiper et al.'s analysis here is an argument against the search skills youth develop on their own (see 7.1 above) having relevance in the academic context. Or, at least, that the skills youth develop on their own are not adequate for the expectations and epistemic values of schools.

Horst et al. make a similar point (2010), although in contrast to Kuiper et al. (2008), Horst et al. seem to believe that learning in the personal context, or, in the genre of participation of "messing around," is more meaningful than school learning. Horst et al. (p. 55, 57) comment that fortuitous searching (discussed above and in Chapter 4) "represents a strategy for finding information and reading online that is different from the way kids are taught to research and review information in texts at school," ways like working with a predetermined topic, identifying a purpose, predicting content, and summarizing the text. The consequent "autonomy to pursue topics of personal interest through random searching and messing around generally assists and encourages young people to take greater ownership of their learning processes." Their ethnography provides examples of youth, without a determined topic and without being forced to use the metacognitive machinery that schools try to teach, developing their own search patterns and search for topics of interest and relevance to them such as: musicians and bands, skateboarding, gaming, or altering MySpace profiles. Horst et al. write, "Although many of these forays do not necessarily result in long-term engagement, youth do use this initial base of knowledge as a stepping-stone to deeper social and practical engagement with a new area of interest" (p. 57). However, Horst et al. do not suggest that such learning is sufficient or that self-directed learning could or should replace schooling. The relationship between youth-driven learning and the set of necessary knowledge as determined by outside criteria of adults and educational institutions is a theme we will further explore under "teaching creation, teaching through creation" below.

While not an intervention study, Kuhlthau, Heinström, and Todd's (2008) study of 574 sixth- to twelfth-graders in ten New Jersey public schools presents some conclusions with pedagogical relevance. Specifically, Kuhlthau et al. use the results to advocate applying Kuhlthau's ISP model (see Section 4) in educational contexts. They found that students who followed the process as described by the model "tended to learn the most (according to the knowledge measures) and felt most satisfied at the project conclusion, while those who skimmed through the process and skipped stages ended up frustrated and demonstrated superficial descriptive knowledge." For that reason they recommend using the model as a "diagnostic tool for intervention in different information seeking contexts" (Kuhlthau et al., 2008; Todd, 2006). Using the model, educators can "recognize critical moments when instructional interventions are essential in students' information-to-knowledge experiences," and in focusing on entire process rather than just the end product, educators are more likely to get students involved in the thinking process.

7.3.2 *Teaching Evaluation*

Classroom interventions that focus on search, such as those discussed above, implicitly convey prescriptions for evaluation, yet few elicited desired evaluation practices from participating students (in an adult-normative sense). Hoffman et al. (2003), however, presents an exemplary case of how strong evaluation practices can arise organically through a program on search. The authors' aimed to provide cognitive scaffolding around search processes by allowing students to "focus on the contents of the resource, evaluate its usefulness, and synthesize information rather than spending the majority of time simply locating appropriate sites" (Hoffman et al., 2003, p. 328). While they included "assess" as a step in their search model, they provided teachers no specific evaluation criteria. Yet doing so constitutes a form of teaching evaluation and isolating evaluative practices in the search process guides students towards focusing more fully on such practices. Ultimately, the students did not distinguish between searching and assessment. Each was "used seamlessly by highly engaged students" (p. 341). Still, Hoffman et al. (2003) demonstrate what search and evaluation might ideally look like once cognitive scaffolding is removed.

Other classroom attempts at tying evaluation to the teaching of search did so less successfully. Kuiper, Volman, and Terwel's (2008) combination of teacher instruction, written guides, and worksheets succeeded in making students more aware of there being a difference between information found online and that found in books. Although students enjoyed evaluation insofar as they got to express their opinions, they never adopted adult evaluative criteria such as reliability (p. 682). While Gerjets and Hellenthal-Schorr included two evaluative steps in a five-tiered search model, they were not met with student engagement sufficient to assess student outcomes. Pritchard and Cartwright (2004) limited the search space—and consequently, the evaluation space—so as to encourage student

exploration and dialogue, yet in doing so limited their study's relevance to interventions focusing on search and evaluation.

Much research focuses on evaluation outside of the search process. Some such researchers observe that youth already know how to find information (Buckingham, 2003a, p. 77), but more often, they are concerned with how youth construct the meanings of the content they come across. As mentioned earlier, some studies (Kuiper et al., 2008; de Vries et al., 2008) try to incorporate constructivist understandings of how youth must relate to the search process to be engaged. Otherwise, search is generally taught through "tool literacies," whereas "literacies of representation" are used only when teaching evaluation (Harris, 2008, p. 165). Here, we use literacies of representation to concern critical skills necessary to analyze and criticize information.

Such literacies of representation are the focus of most programs falling under media literacy or media education, of which Buckingham (2003a, p. 53-67; 2004) outlines key conceptual areas. These are: understanding how meanings are constructed in the "language" of media; understanding how reality is represented in media (e.g., do media representations contain biases or stereotypes?); understanding how media are produced (e.g., what are various interests and motives of media producers?); and studying how media targets audiences (e.g., how do media try to appeal to audiences? how do different audiences respond to media?). The conceptual framework outlined above is not tied to a particular body of knowledge or skill sets, and is broadly applicable to a wide range of media, both old and new. Common strategies for teaching media include textual analysis, contextual analysis, case studies, translations, simulations, and production (Buckingham, 2003a, p. 70-84).

Harris (2008, p. 166) and Metzger (2007, p. 2081), from their experiences working in education and LIS, characterize the common approach (i.e., the approach among classrooms not documented by literature) to teaching website evaluation is to prescribe a fixed set of evaluative criteria, such as in the form of a checklist, for students to apply across all search context. The checklists introduced in class typically emphasize criteria such as accuracy, authority, objectivity, currency, and coverage (Harris, 2008, p. 166; see also Metzger, 2007, p. 2079). That is, when evaluation is taught at all; Buckingham and Domaille (2002, p. 5) note that media education courses at the high school level, where they exist, are mostly offered as electives (although this does not speak to how widespread teaching of literacies of representation is outside media education classes, or how much the Internet is integrated into the class).

While not providing specific examples, Harris (2008) and Metzger (2007) critique the checklist approach (Meola, 2004, for a discussion of how undergraduate education has used the checklist approach since the 1990s; see also discussion of Harouni, 2009, below). A fixed set of criteria, though

useful and relevant in one context, can quickly become meaningless when applied to another context. For example, evaluative criteria intended for academic research (e.g., finding "authoritative" academic sources) are not very helpful when youth are seeking relationship advice or music recommendations (Harris, 2008, p. 166). Harris (2008, p. 166) argues that the checklist approach is often out of sync with youth's everyday-life information-seeking practice, and that it neglects criteria (such as website design) that matter to youth. Outside of the academic context, Harris argues, it is not realistic to expect youth to adopt evaluative criteria that do not reflect their practice and preferences. She argues that "the evaluation of information is subjective, relative, and situational rather than objective, absolute, and universally recognizable," and hence website evaluation exercises should focus on guiding students through the critical thinking and inquiry process to get at a nuanced analysis, rather than emphasizing the "correct" way to interpret a website (2008, p. 165-167).

Harris (2008, p. 170) illustrates how she guides students through critical thinking, describing an activity she does with her high-school students. She does a Google search with her class for Martin Luther King, Jr., and has her class look through the results. She reports her class "always" selects the site "Martin Luther King, Jr.—A True Historical Examination" (http://www.martinlutherking.org) to look at first, which Harris interprets as being "because of its credible-looking domain name and also because of its invariably high placement ranking" (p. 170). She then gives her students "several minutes to read the screen. It does not take them very long to realize that something is amiss" (p. 170). This site is run by a white supremacist organization, which disguises its views through mainstream markers of quality such as a high rank, a .org address, and a clean and professional-looking layout of graphics and text. Ironically enough, its high ranking is probably because so many librarians and educators link to it as an example of a deceptive site (p. 163).

The students catch the deception, Harris (2008, p. 170) says, partly because they are expecting a 'trick,' but then they become skeptical that anybody could fall for it. So she shows other sites—including sites by teachers and librarians and news sites—that have unwittingly linked to the white supremacist site. Her students then become enthusiastic, "Caught up in the fervor of knowing that they see what others do not see," and they become enthusiastic "to learn some relatively obscure detection techniques" (p. 170). She then demonstrates how a domain name search reveals that Stormfront (http://www.stormfront.org), a white supremacist organization owns martinlutherking.org (Harris, 2008; that it is a white supremacist organization is fairly apparent from its website). The result of this exercise will not be that students will look up the owner of every site they consult (nor is that even necessarily desirable), but that they become aware of the *possibility* of deception, and that Harris finds a way to engage and excite them (through the special feeling of having elite knowledge) through

which she can discuss website evaluation. Her involvement of students through collaborative thinking and group discussion also helps her lesson to be effective (p. 170).

Harouni (2009) developed an experimental curriculum that sought to take advantage of and improve on students' online research habits, rather than confine them to a rule-based evaluation "check-list." He observed that students in his 11th grade social studies class relied heavily on Wikipedia for research projects, resulting in work that was factually extensive but lacked critical analysis (p. 473-477). Rather than prohibit this search strategy altogether, Harouni worked with students to critically evaluate information through a series of lessons in which students evaluated Wikipedia entries for fraudulent information and bias (p. 478) Although focused on Wikipedia, this curriculum had positive benefits to students' evaluative strategy for other sources. Harouni notes that, after 18 months of this curriculum, students more frequently cited articles that were more comprehensive than summary, indicated clear authorship, and were free of evident bias. This shift suggests that students developed through practice criteria for evaluation without being confined to a rule-based, evaluative "checklist," and could therefore articulate the reasons behind their evaluative decisions (p. 488-490). Perhaps most interestingly, Harouni incorporated Wikipedia into his students' term paper assignments, allowing students to elect to contribute to a Wikipedia entry. This initiated learning about editorial authority and peer review, as students' work were subject to review by the larger Wikipedia community (p. 489).

Fabos (2008, p. 843) interrogates the ideological dimensions of "information literacy" as does Harouni (2009, pp. 480-481), arguing that all information decision-making occurs within a larger social context. Fabos critiques what she sees as the limited perspective of discourses of "information literacy" that works within the given information environment and does not critique it. She argues that the Internet is not neutral, and neither are information literacy or educational resources; all are subject to competing political and economic pressures. Information is not neutral, value-free, or objective, and to treat it as such without regards to the framework of its political, social, and economic construction is to see only a basic view. Similar to Buckingham's (2007a, p. 45) critique of the implications of the term "literacy" as not implying the critical dimension and that what we really need is a critical literacy, Fabos too advocates for *critical* literacy, noting that in the United States (Buckingham is based in the UK), "media literacy" is "often a watered-down criticism emerging from conservative religious, groups, politicians, and parent groups who seek to eradicate programming they deem too violent, sexual, or offensive" (p. 845).

Some teaching through games that involve teaching evaluation, but this involves learning historical (Raessens, 2007; Squire, 2005; see also Squire, 2008, pp. 660-661) or scientific (Dede & Ketelhut, 2003) evaluation, not evaluation of information on the Internet, and so is not within the scope of this

paper. There are also games incorporated into educational efforts. The question of the relationship between "video-game literacy" and in-school literacies is a much larger one; Squire (2008) reviews a body of literature suggesting that games present a fundamental challenge to the classroom structure that is not so simply resolved by incorporating games. However, when teachers use video games in educational settings, it is to address content knowledge, rather than to search and evaluation in the ecosystem of digital media, and thus (with some exceptions relating to creation, discussed below) video games are outside the scope of this review.

7.3.3 *Teaching Creation and Teaching Through Creation*

Creative production in the academic context has been the object of some debate in the literature. Buckingham (2003a, pp. 98-99, pp. 134-135) writes that in the 1980s, theorists widely held that new vocationally-oriented media courses focusing on production skills were lacking intellectual merit, and that the creative outputs simply reproduced media ideologies rather than critiquing them, but over time that has shifted to a consensus about a central role for production in media education. Peppler and Kafai (2007, p. 151) assert that now, even more than before, new technologies make production more accessible and easier to manage. While classroom use is not widespread (Peppler & Kafai, 2007), some educational programs centered on creative production nonetheless merit consideration.

Likely the oldest, largest, best-documented, and most visible educational initiative structured around creation is the Computer Clubhouse Network. Its basic aim is to create after-school spaces where middle- and high-school youth from low-income communities can access technology, professional-level software, and mentors. Experimentation and creation, rather than the development of technical skills, characterize the program's attitude on technology's use. This guiding idea emerged from constructionism, an extension of constructivist learning theory that postulates that individuals learn best when engaged in personally meaningful creation. The MIT Media Lab and Computer Museum (now part of the Museum of Science in Boston) started the first Clubhouse in 1993; now, with funding from Intel and other organizations, it has expanded into the Computer Clubhouse Network with over 100 Clubhouses across 20 countries involving a total of more than 50,000 youth (Kafai, Peppler, & Chapman, 2009a, pp. 2-3, 13).

One of the Clubhouse's primary guiding principles is to foster an environment and culture of respect and trust. Mentors set the tone by encouraging kids to develop their own ideas. Youth are made to feel safe from judgment or ridicule, so they can feel safe to try out new ideas, and in return are expected to treat others in the same manner (Rusk, Resnick, & Cooke, 2009, pp. 24-5). Clubhouse projects, then, often address community issues and needs, and themselves become a site around which youth—such as

the homeless youth who make up 70% of participants in the Tacoma Clubhouse—form a community identity (Peppler, Chapman, & Kafai, 2009, pp. 39-40).

In addition to fostering an environment open to creativity and experimentation, the Clubhouse fosters the growth of digital fluencies, academic skills, and emotional measures, such as confidence. Michalchik, Llorente, and Lundh (2008) compared youth who visited monthly to those who visited daily and youth whose visits were one hour or less to those whose visits were at least three hours. A total of 3,732 members across 92 Clubhouses participated in at least one survey, with 20% participating in at least two surveys (p. 8). On measures of breadth and depth of technology use, competence, and technology for school use, daily visitors scored 55% and lengthy visitors 57%, versus 39% for monthly visitors and 44% for brief visitors (p. 28). For a measure of problem solving ability, daily visitors scored average or above average 60% of the time and lengthy visitors 61%, versus 49% for monthly visitors and 49% for brief visitors (p. 15).

Participants who spent more time at the Clubhouse than their counterparts also fared better in academic tests. Lengthy visitors scored average or above average on overall academic measures 56% of the time, versus 44% for brief visitors (p. 40). 57% of lengthy visitors and 56% of daily visitors scored average or above average on measures of school engagement and academic self-perception, versus 48% of brief visitors are 45% of monthly visitors (p. 49). 76% of daily visitors and 75% of lengthy visitors planned to continue their education and attend college, versus 66% of monthly visitors and 66% of brief visitors (p. 49). Lastly, the study also found a correlation between spending time writing Clubhouse newsletters, articles, and stories and school engagement.

Other classroom and after-school programs have attempted to foster environments conducive to appropriating creative skills gained in the personal and social contexts to the academic, with mixed results. In one after-school program, Ito (2009) observes youths' and supervisors' understandings of creative mastery diverge significantly. Ito's ethnography of 5thD, an after-school program for youth use of educational software, media creation tools, and non-digital tools and games overseen by undergraduate supervisors, focuses on the educational use of SimCity2000 (pp. 18-19). Undergraduates supervised ten- to –twelve-year-olds playing the game; while Ito reports that the supervisors did not formulate specific educational goals, they nonetheless imposed certain restrictions on youth participation. One supervisor, a "power user" of the game, tried directing youth towards more sophisticated technical mastery without ensuring they were having fun. In response, the kids' gameplay often subverted the supervisors' desires for them to follow the game's intended narrative and structural logic. One gamer delighted in destroying, rather than building, cities in the game designed to

simulate urban planning p. 177). Evidently, the youth norms surrounding technical mastery diverged from those of their college student supervisors.

In a Norwegian ethnography, Erstad, Gilje, and de Lange (2007) record instances in which teachers proved unhelpful, and even obstacles, to student collaboration in creative activities. The authors study a digital production course, part of a popular media education component of the national education system, with the goal of understanding how to enhance analytical reflection during the production process within the school context (p. 186). In the production course, one student knowledgeable about a Japanese composer of video game music taught the others this content knowledge, and then together they collaboratively worked through searches to find the correct spelling, find sites devoted to the composer, and ultimately select one as having the resources they sought (resembling the "techne-mentor" relationship of Finn, 2010, pp. 191-193). In another case, students worked together to find a free font to use for titles in the digital movie they were producing (pp. 189-190). Yet the students' motivations for such activity did not match the expectations of their teachers. In the first case, the teacher reprimanded them to "quit playing," until they protested and convinced the teacher what they were doing was relevant to the task (pp. 192-193). In the second case, the teacher instructed students not waste time on design elements but to focus on journalism and telling the story (pp. 190-191), despite their protestations that design expresses understanding of an idea. O'Brien, Springs, and Stith (2001) provide a more successful example of an academic initiative that engages students in multimedia production, reflective analysis, and research and evaluation.

Erstad et al. (2007) assert that students' capacity to successfully transfer skills gained in informal settings to the classroom, despite their disadvantaged negotiating position with teachers, is contingent on two factors. With specific regard to remixing and reusing media, they identify: "(1) access to multimodal resources provided by high computer density and general access to resources on the Internet; and (2) access to digital software packages which make the re-mixing process possible in media productions" (p. 194). Certain institutional constraints can also hamper cross-context transfer, namely: the need for "an institutional openness that allows students to search and work creatively," and the lack of analytical reflection built into the curriculum around remixing practices (p. 195). Erstad et al. note that the concept of "digital literacy" written into the Norweigan national curriculum is still skill-oriented, and that such a conception does not grasp "the productive interaction between agent and cultural tool" (p. 196) that makes possibly the fluency in searching and reusing that develops through remixing practices.

Blogging is one form of Web-based writing that educators have attempted to bring into the academic context, as mentioned in Section 6, at times unsuccessfully. As we saw in Witte's (2007) case of trying

to get her students to blog for class and structure a curriculum around content creation, importing social norms to academic contexts can result in problems (p. 93). Although her students enthusiastically used blogs in the academic context of Witte's class, it turned out that their notion of blog usage was incompatible with the academic needs of direction and orientation towards set goals (at least at first). This does not highlight impossibility of transference, only that the transfer is not automatic.

On the other hand, Similarly, Dexler, Dawson and Ferdig (2007) used blogs to excite third-graders about the creative practice and to motivate them about the class content matter. The authors set up a blog for a third-grade classroom where students could receive feedback from high school and college students. Drexler et al. found that the connection with the high school and college students motivated the students and infected them with interest about their Native American tribe of study, noticing students incorporating ritual and artistic motifs into playground activity. We might infer that the teachers in this case cultivated a social context surrounding creative practice amenable to academic norms.

Other cases include Désilets and Paquet (2005), who incorporated the collaborative authoring of a wiki into their fourth- through sixth-grade classes in Canada, and Walsh (2007), who set up a blog to use a writing tool familiar to his twelve- and thirteen-year-old students. Oravec (2002) expects use of blogs in classrooms to grow in the future, and Richardson (2006) explores the constructive uses of blogs. Sterling (2008) is another advocate for trying to capture the informal writing done by students in a formal context. Ferdig and Trammell (2004) even suggest that the writing that takes place on blogs is appropriate for counting towards fulfilling school writing requirements.

Skepticism of such efforts, such as that of Knobel and Lankshear (2006), look at the lack of enforcement of grammatical rules and question the relevance of out-of-school blogs. There is an important recognition here that sometimes, to the dismay of educators, *negative* outside norms (rather than positive ones of engagement and motivation) from the social and personal contexts have bled into the academic context. Carrington (2005) discusses a case of a 13-year-old girl who submitted an essay written in text message shorthand, which Adlington & Hansford (2008, p. 6) identify as low-quality writing.

But as pointed out by Dowdall (2006, p. 162), the particular case of this student's use of text message shorthand in schoolwork represents a disconnect between the expectations of the teacher and those of the student. In our information quality framework, calling the writing or style of the girl's essay low-quality, or reflexively faulting out-of-school blogs for grammatical failings, is only accurate from an

adult-normative perspective. Indeed, there might even be legitimate adult uses of shorthand writing forms; in Japan, there is a genre of "cell phone novels," or *keitai shousetsu*, which are stories written in short installments of text messages and often read the same way, sent to readers' phones (Norrie, 2007). A range of communication already happens in the restricted format of limited-character texts, and writers—both youth and adults, and often first-time writers—have begun to weave fiction narratives with the form of communication (Norrie, 2007). Or, as a counter-example to the notion that digital communication makes language less formal, the use of an online message board for science education drastically improved students' desire to write properly in a study by Songer, Lee, and Kam (2002, pp. 142-143), conducted with 10,861 fourth- to eighth-grade students.

Some research looks at the effect of social networking and microblogging on Twitter (Higher Education Research Council, 2007; Heiberger & Harper, 2008; Junco, 2010; Pasek, more, & Hargittai, 2009), yet it looks only at college students. Still, the comments of Grosseck and Holotescu (2008) about possible use of Twitter in the classroom are broadly applicable. They note that it has potential for communication and collaboration, but that the dangers of distraction are large.

While we have not found systematic studies of using social networking sites in class at the level of primary or secondary education, Kirkland (2008, p. 16) suggests that students publish their works on social networking sites, and that this could encourage them to critically reflect on their use of social networking sites (perhaps by being a starting point for discussion).

A sub-topic of creation is not creating with or within video games, but actually creating video games. Willett (2007, pp. 170-171) aimed to see if a "reservoir of informal knowledge" that youth build "might be accessed and whether it could be transformed by being applied in production-based situations" (p. 170), and whether production could be used to critically engage with the participant's experiences of playing video games. Documenting a weekly, pilot game-design class for 10 nine- to thirteen-year-old boys, Willett observed that the tutor was most effective when she showed the students how to carry out an effect more efficiently than they were currently doing (p. 175). In such cases, they were able to take the skill or technique and apply it in other situations. When the tutor tried to present a more structured lesson progression, she became frustrated, feeling that the boys were not working hard enough, and not practicing with the software (p. 173). When she tried giving one-on-one instruction, and tried to scaffold learning, Willett observed the students did not gain the same ability to generalize beyond the given information and that the scaffolding was not successful (p. 175). The main difficulty proved to be in the use of the professional software, and in particular, integrating the 3D models into Photoshop and Flash. The ability to make high-quality 3D models, with "quality" corresponding to the students' experience of the graphics of professional games (p. 178), and yet the

inability to integrate these into Flash led to the students ultimately not producing any interactive content. However, Willett notes that despite her observation of the students' apparent frustration, almost all returned when the project was run a second year (p. 176).

The Computer Clubhouse has also attempted to have youth not just playing video games, or creating and modifying in-game content (i.e., within fixed parameters), but creating games (Peppler & Kafai, 2007b, p. 1; 2007a). From studies of such efforts, interface design emerges as a clear practice area in which youth game designers can express creative norms. Kafai and Peppler (2007a, p. 152) argue that engaging with interface and production is one way to address some of the issues Buckingham (2003a) identifies in the need for critical literacy, writing, "While youth are already discriminating readers of the genre, youth are not as proficient at articulating what makes a particular video game or software application 'good.' Asking youth to design video games challenges them to make these assumptions explicit and asks them to build upon this knowledge to make informed suggestions for change" (2007b, p. 2). Kafai and Peppler (2007a, p. 152) argue the creative production leads to critical reflection on media construction and questioning of conventions. For example, Kafai and Peppler (2007a, p. 154-163) researched a Computer Clubhouse in South Central Los Angeles that successfully used a user-friendly programming language called "Scratch," developed by the MIT Media Lab, to engage youth in programming and design in such a way that connected youths' existing interests to media production and critical reflection.

[1] Yet despite recognizing the subjective aspects of quality, Eppler (2003, p. 17-18) still identifies some objective components. Eppler's notion of quality's objective components makes sense only within the confines of the management paradigm. While we emphasize the overall relative, or subjective, nature of information quality criteria, we also recognize that people determining the quality of information in various contexts (such as management, or the classroom, or youth peer learning activities) often hold such criteria to be objective.

[2] In the U.S. context, *college* is a noun referring to the institution, either a stand-alone institution or as a constituent of a larger university, but is also used as an adjective as in "college education," "college degree," and "college students." *Undergraduate* refers to the student, but may also be used as an adjective in "undergraduate education," "undergraduate degree," and "undergraduate institution." Despite formal redundancy, the phrase "undergraduate students" is also common usage. The typical undergraduate degree is the four-year bachelor's degree, but some institutions such as community colleges and junior colleges award the two-year associate's degree, considered the equivalent of the first two years of a bachelor's degree course. Note that in the United States, unlike many other countries, a professional degree (mainly, the four-year M.D. medical degree and the three-year J.D. legal degree) is an advanced degree obtained *after* the undergraduate degree. Master's degree programs are also not typically offered as part of college education, and require a separate application process and admission with a bachelor's degree as a prerequisite.

[3] High school grades are numbered, but the terms freshman, sophomore, junior, and senior are also frequently used. If educational level is not clear in context, these terms will be proceeded by "high school" or "college," as in "high school sophomore" and "college sophomore").

[4] While acknowledging critiques of interrogative questions (Shenton et al., 2008, p. 153), the survey decided to more or less directly address the issue, asking the three open-ended questions: "1) What do you think of when I say the word 'information? What do you think it means? 2) What do you think is good information? 3) What do you think is bad information?" (Ibid.)

[5] For a discussion of youth information-seeking about drugs before there was widespread consultation via the Internet, see Todd and Edwards (2004), which reviews research from the 1990s about Australian youth information-seeking and utilization in relation to drugs.

[6] An exception is a chapter by Kuiper and Volman (2008, p. 241); while this is entirely based within LIS (Ibid., pp. 242, 254), and is for the most part an adaptation of Kuiper, Volman and Terwel (2005), its publication within a larger book devoted to research on new literacies (Coiro, Knobel, Lankshear, & Leu, 2008) hopefully represents the beginning of a dialogue between research into youth information-seeking and studies of new literacies.

[7]Information seeking and IPS communicate little despite drawing on overlapping sets of studies from 1998-2002, as is evident by comparing Shenton (2010, p. 17) to Walraven et al. (2008, p. 628). For example, Shenton (2010) identifies journals publishing work on information behavior but does not include *Computers in Human Behavior*, whose issue 24(3) from 2008 is a special issue devoted to instructional support for IPS and is extremely relevant to information behavior.

[8] We are grateful to their review for providing important background work, and for enabling us to crosscheck the set of references we found. Note that we do not include all sources covered by Kuiper et al., such as a paper by Mistler-Jackson and Songer from 2000, based on our criteria of looking only at sources discussing the search process within the totality of the Internet's information ecosystem.

[9] Rich 2002 (2002, p. 146; 2008, p. 56) helped us arrive at this formulation, which we believe offers a simpler and more usable distinction between decision making in the search process and evaluation.

[10] Note that we do not use the word "variables" in the sense that Agosto (2002b, pp. 314-315) uses it; she uses it to refer to describe factors affecting an individuals' behavior, whereas we use it to describe variation between groups or circumstances. Our use corresponds to what Kuiper et al. (2005, pp. 294-2999) call "student characteristics" and "task characteristics."

[11] No etymological relationship to the acronym LIS, which is library and information science.

[12] For the claim that "Through e-mail, instant messaging, and texting, youth already create close-knit 'research' teams that share findings and implicit credibility assessments," Lankes does cite a source, but it is a review of educational projects around digital technologies and related research and contains no mention of e-mail, instant messaging, texting (one mention of "text messaging" is in the context of basic literacy), of youth forming research teams (except in one case of a school program that organized students into research teams), or of youth sharing information (of any type), and the only mentions of credibility or assessments are in relation to school programs.

[13] Wallace et al. interpreted this as a misunderstanding on the students' part, thinking that search results pages were a table of contents, and that key words served as an index to that table of contents. In this sense, students imported their experience of looking up words in a book index to the Internet, where it was appropriate (pp. 94-95). However, this study is arguably quite dated now, and it questionable whether students would be primarily familiar with book indexes such that they could project expectations onto search engines.

[14] While we interpreted Agosto's work as commenting on youth behavior while browsing as expressed through preferences because free surfing was involved, her work itself was asking about evaluation criteria and what students themselves articulated themselves as caring about (Agosto, 2002b, p. 321).

[15]For example, previous psychology literature has found that preadolescents believe "that there is an absolute correspondence between what is seen or perceived and what is" (King & Kitchener, 1994, p.

47-48; quoted in Fitzgerald, 1999), suggesting that, at least for earlier phases of cognitive development, distinguishing between an indicator of quality and quality itself would be an adult imposition.

[16]An epistemology that Daniels refers to as found in wider ideologies and historical narratives that permeate social foundations in the U.S.

[17] In research on Dutch adults, Van Deursen (2010) finds that Internet users possess better technical Internet skills (operation and formal skills, in his taxonomy) than information skills. In other words, the subjects were better at manipulating the mechanics of the Internet (e.g. Web browser, search engines, menus) than dealing with information on the Internet. In fact, Van Deursen observes that in his study, "nobody seems to evaluate information on the Internet," noting instances where subjects assumed that sources on a government website were credible, although they were samples of work by grade school students (p. 146). Additionally, Van Deursen finds that young adult subjects perform better with medium-related skills than older adults, but worse with content related skills (p. 149). It is important to note, however, that these results do not necessarily apply to all youth or other populations not sampled in the study.

[18]However, health information does not have to be untrue to be dangerous; misunderstanding from a lack of context is sufficient to cause harm, (Eysenbach &Diepen, 1998, p. 1496), which again highlights the importance of framing issues through concepts like information quality that include context. For an example, see the discussion of Erowid.org in Section 4.

[19] Fourth, and perhaps most importantly, the fears about possible harms are still just fears. There is little evidence of any discrete and distinctly identifiable cases of harms coming from youth failure to "correctly" identify information. Perhaps the clearest arena in which such harms could manifest is health: there are only a handful of examples of harms resulting from bad information online or from incorrect application or interpretation of information online, and all reported cases involve only adults (Crocco, Villasis-Keever, & Jadad, 2002, p. 2870; Weisbord, Soule, & Kimmel, 1997, p. 825; Eysenbach and Köhler, 2002a, pp. 238-9). This does not mean that we should not take risks seriously; there might well be unreported cases of harm (Crocco et al., 2002, pp. 2870-1), or increasing cases of harm in the future, but, it is important to contextualize fears and note that the conditions for harm have already existed for some time and yet there have not yet been any widespread incidence of harm.

[20] Note that the study of new literacies is a *research* area, rather than an educational mobilization (with which the word "literacy" is often associated). Buckingham's (2003, pp. 37-38; 2007a, pp. 43-44; 2007b, pp. 148-150) critiques of the choice of the word "literacy" focus mainly on the idea of literacy as something to teach, rather than something youth (and adults) are already doing. The distinction Buckingham draws between the *functional* literacy implied by the term, versus the *critical* literacy that is actually what is important, is not relevant for looking at literacy in terms of practice. His critique that

"the analogy [to literacy as reading and writing] is used to bolster claims of the importance – and indeed the respectability – of the new area of study" (2003, p. 36) similarly is not applicable to such usage, as "literacy" in this case is not an analogy based on pedagogical prestige, but one based on description of practice, and an organic extension of the existing field of research into (basic) literacy research rather than an entirely new area of study.[20] It ties into research into basic literacy in English and other languages that indicates that even learning to read and write is far from an acquisition of a mechanical skill, or neutral, but a process that is culturally situated around bodily dispositions (Kenner, 2003, p. 86; cited in Stein, 2008, p. 883, in Coiro et al., 2008). Put differently, new literacies are by definition that which kids *have*, an ethnographic construct; media literacy, information literacy, digital literacy, or 21st century literacy is what adults have determined kids *should have*, a prescriptive construct. Even as the framework of new literacies has begun to be used to generate educational possibilities, such as in the work of Pahl and Rowsell (2005), such efforts refer to new literacies as what youth are already doing, not what they should be or need to be doing. So from this perspective, Coiro et al. (2008 pp. 6-7) can take mostly for granted the descriptive applicability of the term "literacies," and identify the main problem of term "new literacies" as laying in the "new" part, and the only problem with "literacies" is in defining the scope of the term (p. 6; see also the discussion of the choice of "new media" in Ito et al., 2010, pp. 9-13). Still, Buckingham's critiques are important to revisit whenever we are at a point when literacy turns from a descriptive discourse to an educational mobilization, as the conversion is not to be taken for granted. Describing youth practices in terms of liter*acies* is not the same as prescribing what educational institutions should teach in making youth liter*ate*.

[21] The designations of ELL (English Language Learner), ESL (English as a Second Language), and EFL (English as a Foreign Language) are variously used in the U.S. to describe students in the school system not fluent in English, and corresponding ELL/ESL/EFL classes are classes set up to increase such students' fluency in English.

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