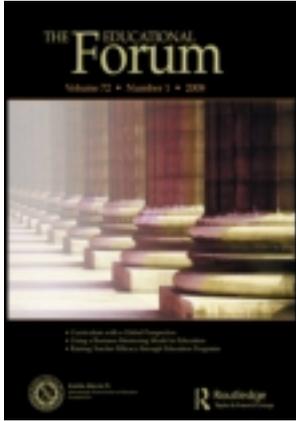


This article was downloaded by: [Portland State University]

On: 03 October 2012, At: 11:25

Publisher: Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



The Educational Forum

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/utef20>

Examining Peer Collaboration in Online Inquiry

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Version of record first published: 03 Oct 2012.

To cite this article: Jill Castek, Julie Coiro, Lizbeth Guzniczak & Carlton Bradshaw (2012): Examining Peer Collaboration in Online Inquiry, *The Educational Forum*, 76:4, 479-496

To link to this article: <http://dx.doi.org/10.1080/00131725.2012.707756>

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Examining Peer Collaboration in Online Inquiry

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Abstract

This study examines peer collaboration among four pairs of seventh graders who read online to determine what caused the downfall of the Mayan civilization. More and less productive collaborative interactions are presented through snippets of dialogue in which pairs negotiated complex texts. Few examples of how teachers can skillfully facilitate collaborative interactions currently exist, despite the call for these skills in the Common Core State Standards. Teaching ideas that support collaborative online reading are featured.

[Supplementary materials are available for this article. Go to the publisher's online edition of The Educational Forum for the following free supplemental materials: set of printable graphic organizers to support collaborative online reading and cross-curricular web resources to support critical evaluation of online content].

Key words: *collaboration, Common Core State Standards, content learning, inquiry, online reading comprehension, supporting collaborative learning*



The Internet has become increasingly central to our daily lives and has changed the way we access information, interact, and learn. With just a few clicks, it offers a range of multimedia resources, dynamic platforms, and digital tools through which to construct and share ideas. However, teachers need instructional support to learn how to harness the power of the Internet to support literacy and learning (Castek and Gwinn 2011). Teaching students creative problem-solving, collaboration, and fluency with technology is not only difficult, but it also represents a significant shift for most classroom teachers who are tentative about using technology to support and extend learning. Yet, guiding students to acquire these competencies can no longer be an ancillary aim—it is an economic and social imperative central to civic participation (Partnership for 21st Century Skills 2002).

To better support learning required in a digital information age, we must first recognize the online reading skills, strategies, and dispositions that students must acquire beyond those needed for traditional print reading. To take advantage of the resources the Internet makes available, students must become skilled at selecting, evaluating, managing, and organizing information effectively and efficiently (National Council of Teachers of English [NCTE] 2007). Many of these higher-order online reading comprehension skills appear in the Common Core State Standards (CCSS) and will be essential for success in both literacy and content area classrooms. In addition, the standards call for extended collaboration in which learners build on others' ideas, express their own ideas, pose questions, acknowledge new information, and modify their views (National Governors Association Center for Best Practices, Council of Chief State School Officers 2010).

Online Reading and Inquiry Learning

Inquiry approaches have become widely recognized as valuable methods for supporting learning across the disciplines (Minstrell and Van Zee 2000). Inquiry can be undertaken individually or collaboratively. In either case, inquiry involves sustained, reflective reasoning (Linn and Slotta 2006) and identification of methods for gathering information and solving problems. In the process, learners work toward solutions by using flexible strategies, revising ideas as they gather information, and comparing results to solutions generated by others.

Online reading demands a similar skill set that involves a self-directed process of searching for information, exploring a range of resources, and synthesizing information found on multiple Web sites. According to Leu, Kinzer, Coiro, Castek, and Henry (forthcoming), at least five practices occur during inquiry-oriented online reading comprehension: (1) reading to identify important questions, (2) reading to locate information, (3) reading to evaluate information critically, (4) reading to synthesize information, and (5) reading to communicate information. Within these five inquiry-based practices reside the skills, strategies, and dispositions distinctive to online reading, as well as other practices that are also important for offline reading comprehension. Table 1 aligns the practices of online reading to specific Common Core State Standards.

There are several similarities between online reading and inquiry learning. Engaging in inquiry learning online helps learners develop the skills and strategies needed for online reading comprehension (Castek 2008) while allowing students to select their own texts

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Table 1. Aligning Digital Inquiry Tasks in Language Arts and History to the Common Core State Standards

Online Reading	Locate	Evaluate	Synthesize	Communicate
Common Core State Standards	Reading to Locate	Reading to Evaluate	Reading to Synthesize	Reading and Writing to Communicate
CCSS Reading Standards for Informational Text – Grade 7				
Key Ideas and Details		1. Cite implicit and explicit textual evidence as support	2. Determine two or more central ideas and summarize	2. Determine two or more central ideas and summarize
Craft and Structure	4. Determine connotative meaning of words	4. Analyze impact of word choice on tone	4. Determine technical meaning of words	
Integration of Knowledge and Ideas	8. Assess if evidence is relevant and sound	9. Analyze how authors shape claims	8. Trace argument and assess whether reasoning is sound	
Range of Reading and Text Complexity	10. Comprehend across complex texts	10. Comprehend across complex texts	10. Comprehend across complex texts	
CCSS Reading Standards for Literacy in History – Grade 7				
Key Ideas and Details	3. Identify key steps in text's description of a history process	2. Determine central idea and summarize	1. Cite evidence 2. Determine central idea and summarize	
Craft and Structure		6. Analyze author's purpose	4. Determine meaning of words in history	
Integration of Knowledge and Ideas		8. Distinguish fact, reasoned judgment and opinion	8. Distinguish fact, reasoned judgment and opinion	9. Analyze primary and secondary sources on same topic
Range of Reading and Text Complexity		10. Comprehend complex history texts	10. Comprehend complex history texts	
CCSS Writing Standards – Grade 7				
Text Types and Purposes	2. Write to convey relevant information	1. Write arguments with clear reasons and evidence	1. Write arguments with clear reasons and evidence	2. Write to examine topic and convey relevant ideas

Continued

Table 1. Continued

Online Reading	Locate	Evaluate	Synthesize	Communicate
Production and Distribution of Writing	6. Use Internet to publish writing and cite sources	6. Use Internet to publish writing and cite sources	6. Use Internet to publish writing and cite sources	4. Produce clear writing appropriate to audience 6. Use Internet to publish writing and cite sources
Research to Build and Present Knowledge	7. Conduct short research to answer question 8. Gather evidence using search terms effectively	9. Draw evidence to support analysis and research (assess argument and reasonableness of claims)	9. Draw evidence to support analysis and research (assess argument and reasonableness of claims)	8. Gather evidence from multiple digital texts 9. Draw evidence to support analysis and research
Range of Writing	10. Write for a disciplinary task in one sitting	10. Write for a disciplinary task in one sitting	10. Write for a disciplinary task in one sitting	10. Write for a disciplinary task in one sitting

Note: Reprinted with permission from Coiro, J., and C. Kennedy. 2011. The online reading comprehension assessment (ORCA) Project: Preparing students for common core standards and 21st century literacies. White paper based on work supported by the United States Department of Education under Award No. R305G050154 and R305A090608.

and explore in-depth the topics of most interest to them. However, because the amount and range of information that each student can access is essentially infinite, effective use of resources encountered on the Internet requires students to be skilled in making informed choices about what they explore. Thus, the Internet is both a much richer context for content learning and also a much more complicated one. As today's students become more reliant on the Internet as a context for learning, and as the CCSS require sustained focus on higher-level thinking, it is imperative that educators provide supported opportunities to engage in inquiry-based online reading.

Peer Support and Online Reading Comprehension

Similar to findings from other studies of social interaction and online reading (e.g., Dillenbourg and Schneider 1995; Foster 2009), our previous work with adolescents indicated that students who read online in pairs were exposed to, and learned to use, a wider array of strategies than when reading online independently (Coiro, Castek, and Guzniczak 2011). In a follow-up study, findings suggested that when learners conducted online inquiry in pairs, new opportunities to co-construct meaning fostered more efficient and productive comprehension of online informational texts (Coiro, Guzniczak, Castek, and Bradshaw 2011). This was the case even when both readers were already skilled at comprehending online texts independently. Although our previous studies were conducted with limited numbers of students, we are encouraged by the idea that collaborative interactions can be supportive to student learning. Thus, we are beginning to consider more fully the important collaborative dimensions of online reading.

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Overview of the Study

The study reported here further explores the collaborative dialogue and strategies used by students who engaged in online inquiry focused on social studies content. Four pairs of students ($n = 8$) were purposely selected from two populations: a seventh-grade classroom in a suburban public school in the Midwestern United States and a seventh-grade classroom in an urban public school in the Western United States. Students were asked to work together to research information on the Internet and to jointly construct an oral response to a prompt provided to them. During data collection, participants met with a researcher and a peer-selected partner. Camtasia[®], a screen capture program, was used to simultaneously record on-screen reading actions, participants' speech and interactions, and frontal views of each reader. Pairs read online to answer the question: *What caused the downfall of the ancient Mayan civilization?*

Data were collected using interactive protocols (Miyake 1986), which involved pairs talking together to perform the assigned task. These protocols provided access to the dialogic interactions that occurred during the collaborative process of meaning-construction as students engaged with each new text, and also as they collaboratively constructed a response.

Data analysis involved examining the dialogue between partners, identifying patterns of collaborative dialogue, and classifying characteristics of more and less productive collaborations. Coding decisions were informed by Granott's (1993) model of collaborative interaction patterns. One dimension of Granott's model represents group interactions along a continuum ranging from independent work to highly collaborative activity. Because our study required students to work together, there was little opportunity for completely independent work. Instead, we mapped the dialogic interactions observed in our data to characteristics of interaction noted in the middle and far end of Granott's continuum. Consequently, in the present study, interactions were categorized to represent either more productive (highly collaborative) or less productive (minimally collaborative) interactions.

Our purpose for highlighting both kinds of interactions was twofold: first, to show what quality collaboration looks like as students engage in online inquiry; and second, to show instances when intervention by a teacher could provide much-needed support in turning less productive dialogue into more productive collaboration. We have found that classroom examples such as these provide the tangible means of visualizing interaction patterns and types of interchanges called for in the CCSS.

Characteristics of More Productive Collaboration

Planning and searching for information. Danny and Mark (pseudonyms) are two seventh-grade boys with very different patterns of academic achievement. Danny is a struggling student who has difficulty focusing in all curriculum areas. Although Danny has well-developed verbal abilities, he scored below proficiency on state tests in reading and writing. Mark is a high academic achiever who scored in the top range of state tests in both reading and writing. In the segment that follows, Danny and Mark work collaboratively to plan and search for online information. After determining their first step—to gather background knowledge about the Mayans—they go on to conduct an extended search

focused specifically on the inquiry prompt, “What caused the downfall of the ancient Mayan civilization?”

¹**Mark:** *So since really we do not know what the Mayan civilization is, we should just search for it and see what it was.*

²**Danny:** *Okay.*

³**Mark** [reading aloud]: *The city of Teotihuacan for centuries was the cultural, religious, and trading center of Mesoamerica.*

⁴**Mark** [interpreting what was read]: *So the city is the center of Maya civilization ... I'm guessing.*

⁵**Mark** [reading aloud]: *In 400 AD the Mayans fall under the domination of Teotihuacan and the disintegration of Mayan culture and language begins in some parts of the highlands.*

⁶**Danny:** *Well, that answers our question right there ... how they fell ... like how they were dominated by the Teotihuacan.*

⁷**Danny:** *Now that we have figured how they were dominated, maybe we can get more information about that now. We can look up about how the Mayan civilization fell instead of just Mayans and their information.*

⁸**Mark:** *I think that Grolier's might work [referring to groliers.com].*

During this segment of productive collaboration, Mark suggests what the focus of their inquiry should be (1). After Danny agrees (2), the pair begins to gather background information about the Mayans to inform their understanding of how the civilization fell (3). Following Mark's interpretation (4), they collaboratively determine the relevance of these details and summarize specifics about Teotihuacan (5). Then, Danny suggests the pair shift their plan to search more specifically for information that will help answer the inquiry prompt (6, 7). Mark goes on to navigate to a reliable source of information, Grolier's online encyclopedia (8). Noteworthy in this collaboration is the role that Danny, the less academically proficient student, plays in refocusing the search. While Mark engages in gathering details, Danny's suggestion to conduct a more specific search comes at a critical point. His assertion (6) prompts the pair to use what they have read to search for specific information related to the downfall of the Mayan civilization.

Negotiating meaning. Abby and Starfish (pseudonyms) are both high academic achievers with well-developed verbal abilities. Abby is organized and a good listener, and Starfish is quiet and studious. In the segment that follows, Abby and Starfish are reading online to negotiate meaning. After locating a Web site that contains relevant information, they engage in dialogue to make sense of the information they found.

¹**Starfish** [reading aloud]: *The reason for the downfall of the Maya is unknown. However there are several possible reasons for their downfall including soil exhaustion, water loss, and erosion.*

²**Abby** [smiling proudly]: *It's kind of like the dinosaur!*

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³**Starfish** [smiling and shaking her head]: I wouldn't have thought of that. [continues reading aloud] Other possibilities include catastrophes such as earthquakes and hurricanes, disease. So, they're kind of like ... um ...

⁴**Abby**: Plague.

⁵**Starfish**: What? [looking confused]

⁶**Abby**: Plague, for disease [referring to the text].

⁷**Starfish**: Oh, right, like it's coming from the earth—earthquakes.

⁸**Abby** [continuing to read aloud]: The collapse of the Maya.

⁹**Starfish** [interrupting excitedly]: Okay, so they're talking about why they collapsed, or why they all, like left. So ... [putting ideas into her own words] disease and earth-related ... catastrophes ... and . . .

¹⁰**Abby** [listening and then scanning further to paraphrase]: No one actually knows what happened to them.

¹¹**Starfish**: Because of the Mayans.

¹²**Abby**: Yeah, even the Mayans don't know what happened to them.

In this exchange, Starfish and Abby effectively engage in collaborative conversation by gathering relevant texts, building on each other's ideas, expressing their own ideas, and jointly acknowledging new information that clarifies their emerging understanding of the text. Responsibility for the exploration of resources and the discourse about them is distributed equally between them, with quick shifts from one to the other. Starfish begins by reading aloud (1) to highlight relevant points about what might have caused the downfall of the ancient Mayan civilization. Abby validates and builds on these points with a personal connection (2). Starfish appreciates Abby's contribution (3), continues reading aloud, and begins to summarize. Abby interrupts and integrates new information about the plague (4–6). Starfish then further clarifies her own understanding by making another connection to a previous section about earthquakes (7). Abby continues reading aloud briefly (8) before Starfish excitedly interrupts to acknowledge the importance of that text and to summarize the key causes contained in the text (9). Abby reciprocates by agreeing with Starfish and further clarifies the mystery surrounding the civilization's downfall by acknowledging, "Even the Mayans don't know what happened to them" (10–12). Before leaving the Web site, Abby and Starfish actively build on these ideas to craft their newly formed understanding of what might have happened to the ancient Mayan civilization.

Determining relevant and reliable sources. Max and Molly (pseudonyms) are high academic achievers who express their ideas skillfully during verbal interactions. Max (a female) is a studious questioner and a headstrong leader. Molly is a socially attentive follower who is strong in formulating arguments. With the support of the researcher, Max and Molly determine whether the online text they read is relevant to the inquiry task.

¹**Researcher** [interrupts]: Where are you reading about the raw materials?

²**Max**: It's right here [points to the text]: The highlands are more temperate and seem to have been the main suppliers of raw materials to the central urban centers.

³**Researcher** [asks students]: Well okay, the central urban centers would be what?

⁴**Max:** *The ... the main places in the Mayan society.*

⁵**Researcher:** *More like the city areas, the more urban city area?*

⁶**Max:** *Yeah.*

⁷**Researcher:** *So the less urban areas provided more of the raw material.*

⁸**Max:** *Okay.*

⁹**Researcher:** *In that sense, they could have provided possibly some crops.*

¹⁰**Molly:** *See I was thinking since they were less fully developed, maybe someone killed them off and then that means there were no more raw materials—you know, they killed off some of the less fully developed areas and then stuff was fine and then things started to go wrong with less materials.*

¹¹**Researcher:** *Okay ... that is a possibility, isn't it? I mean it could be uh ... good thinking. Actually good thinking—we don't know, but that's what you're doing right now is you're gathering information.*

¹²**Max and Molly:** *[nod their heads in agreement]*

In this segment, Max leads the quest for relevant meaning by relating raw materials to the information they read on previous Web sites about crop loss (2). Molly is attentive, but seems to let Max initiate the direction of the reading. With some intervention and redirection from the researcher (1, 5, 9), Molly is able to summarize the main points and integrate them with information previously read as well as with her prior knowledge (10).

Max and Molly, like many adolescents we have worked with, are not very skilled at evaluating online resources for relevance or reliability. In this case, the researcher interjects a few high-level questions to help keep the pair on track. This just-in-time support helped Max and Molly integrate the information they read together to form a more complete understanding. The peer support Max offered during the dialogue helped Molly connect what they read to her prior knowledge. Observing numerous adolescents as they read online, we have found that judging the veracity of online sources may best be facilitated in partnership with the teacher. Posing questions is a technique that is responsive to students' needs and can help turn a less productive interaction in a more productive direction.

Synthesizing across multiple sources. This dialogue follows Abby and Starfish as they wrap up the inquiry task by productively synthesizing across the resources they examined in a collaborative manner and drawing conclusions to respond to the prompt.

¹**Abby** *[reading aloud]: Tree pollen disappeared almost completely when their civilization collapsed ... and was replaced by the pollen of weeds. ... And the region became almost completely deforested.*

²**Starfish:** *So, their forests didn't grow. So, like ...*

³**Abby** *[reading aloud]: Erosion would have worsened [mousing over "worsened" for emphasis].*

⁴**Starfish:** *Just before [referring to the text]: Just before the civilization's collapse. See how erosion would have, uh ...*

⁵**Abby:** *worsened ...*

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⁶**Starfish:** *Yeah, it would have ... so then ...*

⁷**Abby:** *It would carry ...*

⁸**Starfish:** *The civilization would have collapsed.*

⁹**Abby:** *So, it would have carried away fertile topsoil so it couldn't have grown there and they would have had to hunt. [skimming further down] All the animals would have left—since they were cutting down trees.*

¹⁰**Starfish:** *Hmm ... mm ... [skimming further and paraphrasing]. They don't have water.*

¹¹**Abby:** *[unintelligible]*

¹²**Starfish:** *So [summing up again] water, natural disasters, erosion, diseases, and Spanish monarchy, and that was it, right—there was nothing else?*

¹³**Abby:** *Nope, that was it.*

¹⁴**Abby** *[reading aloud]: They argued about whether the downfall of the Maya civilization was due to drought or warfare or disease, or a number of other possibilities.*

¹⁵**Starfish:** *Those are kind of all like ...*

¹⁶**Abby:** *Yeah, all the things that we had.*

¹⁷**Starfish:** *and, Spanish monarchy, warfare, and then disease. So ... So, let's go over this again. Okay ... we have droughts, and ...*

¹⁸**Abby and Starfish** *[together]: disease ...*

¹⁹**Starfish:** *and other ...*

²⁰**Abby** *[interrupts]: and the Spanish ...*

²¹**Abby and Starfish** *[together]: and the Spanish*

²²**Abby:** *and erosion ...*

²³**Starfish:** *and erosion, drought ... erosion, drought, disease, the Spanish monarchy, and then other natural disasters.*

In this exchange, Abby and Starfish collaboratively construct a summary of the salient points from their reading in a productive, back-and-forth exchange that enables both students to contribute to the conversation. At this point, Abby and Starfish have read across seven different Web sites and have built a coherent list of possible causes for the civilization's collapse. They begin by highlighting and interpreting pertinent textual evidence that supports their reasoning that deforestation was one probable cause for collapse (as read elsewhere) (1–10). Then, Starfish connects these ideas to other potential causes they have read across multiple texts (12), and Abby confirms with additional evidence that supports their thinking (13–16). At the end of this exchange (16–23), there is evidence of a true jointly constructed summary that succinctly integrates their findings. At times, the students even talk at the same time as they try to build on each other's ideas.

In summary, evidence of productive collaboration during online reading was evidenced by four key characteristics: (1) strategic planning before searching, (2) interaction that drew attention back to the inquiry prompt, (3) dialogue that helped determine whether online resources were relevant to the inquiry prompt, and (4) equal contributions to the dialogue that resulted in a jointly constructed summary that included salient details. Our analysis of the same set of transcripts also revealed instances of less collaborative interaction patterns, as illustrated next.

Characteristics of a Less Productive Collaboration

In snippets of dialogue characterized as more productive, both students contributed ideas, made use of each other's suggestions, and shared responsibility for the pair's actions. Each partner actively listened to the other and both worked together toward a shared goal. In contrast, less productive collaboration was marked by a lack of active listening, with each partner seeking to advance his or her own individual idea. In these instances, the dialogue was marked by disconnected contributions that caused the conversation to veer away from the shared goal. Less productive collaboration also lacked equal participation from both partners. Instead, one partner took control while the other student was less engaged in discussing ideas and shaping the pair's actions. Snippets from students' interactions that further illuminate these common patterns follow.

Planning and searching for information. In this excerpt, Danny and Mark get stuck on an idea and have a hard time letting it go. Danny attempts to place the Mayan's downfall within the history of events found on a timeline. Trying to accurately place the date derails the conversation and takes the pair temporarily off track.

¹**Danny** [*reading subtitle*]: *Preclassic period ...*

²**Mark**: *Yeah. [begins reading] During the ...*

³**Danny**: *Do you think that will work? . . . I don't think that we really need to read this ... yeah didn't they fall after the last period?*

⁴**Mark**: *the late classic ...*

⁵**Danny**: *Yeah ... so [scrolling down the Web page] ... the Classic period is really what we want.*

⁶[*a few minutes later, after the pair has gone on to discuss other ideas and read other Web sites*]

⁷**Danny** [*referring back to the timeline*]: *Oh wasn't it in this Post Classic period, when they fell? [referring to new paragraph with a new subtitle] ... oh ... yeah it was either the Post Classic or the very last one ... the Pre- ...*

⁸**Mark** [*ignoring Danny and reading a new subtitle, hoping to move on*]: *The Ancient Mayan Civilization ... Do you want to read this? The Ancient Mayan Civilization?*

In this segment, Danny navigates a timeline and negotiates what the dates and time periods convey about the downfall of the Mayans (1). Danny struggles to interpret the timeline and cannot agree about which period of time the downfall happened (3–5). Even after navigating away from the timeline (6), Danny insists on accurately placing the time period when the Mayans fell (7). Mark attempts to move the pair on to a different area of the Web site (8). Danny's insistence on nailing down the correct date persists, but this is neither an important nor crucial detail. Despite his attentiveness to dates, his confusion is never resolved. Avoiding irrelevant details is an important aspect of skilled online reading. Teaching students to determine importance can be a useful strategy in instances like this.

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Negotiating meaning. Palomita and Paige (pseudonyms) are two conscientious female students who have well-developed academic abilities. Palomita is outgoing, curious, animated, and a leader. Paige is an attentive, focused learner who is a bit shy. While reading online, this pair becomes side-tracked by Palomita's confidence in her prior knowledge about the Mayans. During their interchange, Palomita explains her strategy for planning and searching, while Paige is distant and uninvolved.

¹**Paige:** *[scrolls quickly up and down the Web page]*

²**Palomita:** *I kinda got the Mayas and Aztecs confused ... and so when I saw this one name, Cortez, it just reminded me, and then I told Paige what I knew from history, and it turned out that I knew a lot more than I thought I did.*

³**Paige:** *Yeah [laughs].*

⁴**Palomita:** *So, um, now we think that we know our answer, so we're going to justify it by searching for something more specific to what we think it is, and if it doesn't sound right, then we'll go back to this Web site and justify...*

Here, Palomita has assumed control by establishing herself as an expert on the subject (2). Palomita thinks she knows the answer and, as a result, the pair's plan is to confirm that answer. They focus on searching for information that supports Palomita's background knowledge, regardless of whether or not what they find is erroneous (4). Productive collaboration is not present, as Paige has accepted an ancillary role in the process (1, 3).

Determining relevant and reliable resources. This next interaction picks up with Palomita and Paige navigating online information and discussing the reliability of the resources they find. The surface-level criteria they use for evaluation impedes the process of higher-level thinking, which should involve identifying and evaluating the claims made by the authors of the site and then examining the authors' credibility.

¹**Palomita** *[reading aloud and paraphrasing]: The reason for the ... is unknown, however ... these are several ... Oh! We should probably do this.*

²**Paige:** *Yeah [clicks to arrive at www.mnsu.edu/emuseum/prehistory/latinamerica/meso/cultures/maya.html].*

³**Palomita:** *And it's dot-edu. I'm sorry, I need to check some stuff cause my science teacher is telling us all about these things that you can do to make sure that you get a reliable Web site.*

⁴**Palomita:** *Okay, umm ... so I gotta check when it was updated [scrolls to the bottom of the page but doesn't read any information].*

⁵**Palomita:** *[unintelligible] Let's see ... references ... oh this is what it referenced, this isn't about it [when it was updated or about the Web site].*

⁶**Paige:** *Yawns [seems uninvolved].*

⁷**Palomita** *[scrolls to the top and scans]: Seems like pretty new ... [referring to the currency of the information] I mean it uses like new information, so let's just read it and see if it sounds plausible.*

⁸**Paige:** *Yeah [getting impatient].*

⁹**Palomita and Paige:** *[continue searching Google ... scanning results]*

¹⁰**Palomita and Paige:** *[arrive at Wikipedia, but don't really look at it]*

¹¹**Palomita:** *Wait, cause you can edit on Wikipedia, so we should find a different source.*

¹²**Paige:** *Yeah.*

¹³**Palomita:** *[clicks to return to the search results]*

¹⁴**Paige:** *Let's just see what they have to say.*

¹⁵**Palomita:** *[has already returned to search results]*

In this excerpt, Palomita is intent on using the Web site evaluation criteria that she learned in school to determine if the Web site they have found is credible (3–7). She prioritizes looking at the URL extension, determining currency of the information, and exploring the references. In the process, she makes surface level judgments but does not engage in actually reading the information or considering Paige's ideas. Palomita goes on to share with Paige the popular warning that Wikipedia is not a trustworthy Web site (11). Paige suggests that they read the information before dismissing it entirely (14), but Palomita has made the decision to steer clear of Wikipedia (15).

Visiting Wikipedia may have allowed this pair to expand their background knowledge, which could have improved their overall understanding. Instead, the pair jumped immediately to a decision about whether the information was reliable before even identifying the claims being made. Teaching students to scan Web sites and identify relevant claims, in addition to judging the reliability of the author, can be a supportive way of keeping them focused on central ideas during inquiry.

Synthesizing across multiple sources. During this interchange, Max and Molly are expected to synthesize information they have read to draw conclusions. However, they become distracted by seductive details and lose focus on the task.

¹**Molly** *[skimming]:* *Mayas ... prized a long, backward sloping forehead; in order to attain this look, infants would have their skulls bound with boards.*

²**Max** *[paraphrasing]:* *They would, um, what's it called, they would have skulls bound with boards to their infants ... so they'd have a backwards sloping forehead.*

³**Molly:** *Hmm ... they did that to the king and queen.*

⁴**Max:** *Yeah, I know but that could kill people too if they did that to a lot of babies ... they could have just killed, like, a lot of a generation.*

⁵**Molly:** *It doesn't say that.*

⁶**Max:** *No, but it could though, if it squeezes their head.*

⁷**Molly:** *Well no, they all developed, they were just elongated [gesturing with her hands].*

⁸**Max:** *Well, they'd have their eyes pulled, like crossed, [reading aloud] they dangled objects in front of their eyes in order to permanently cross their eyes.*

⁹**Molly** *[eyes wide open in surprise]:* *This is still practiced today! Wow! [makes face]*

Examining Peer Collaboration in Online Inquiry

¹⁰**Max:** *I don't get that [Molly laughing in agreement]. How would you see?*

¹¹**Molly:** *[crosses her eyes and looks at Max to get her reaction]: It's cool.*

This excerpt introduces a common pattern that is often replicated among adolescents reading online—being drawn in by seductive, yet irrelevant, details. The Web site Max and Molly take time to read introduces remarkable information about Mayan cultural beliefs and practices regarding beauty (1–9). They remain on this Web site because they are interested in its content. However, the information is distracting. No effort is made by either participant to determine the importance of these details as they relate to the task.

These less collaborative interactions were evidenced by four common characteristics: (1) difficulty determining importance and instead focusing on irrelevant details; (2) using incorrect prior knowledge as a jumping-off point and proceeding to verify it through online research; (3) using surface-level criteria to determine the reliability of information, without taking time to identify the author's claims or determine their accuracy; and (4) becoming distracted by seductive details that subvert focus from the inquiry task. In addition, partners were less active in listening to each other's suggestions. In some cases, one partner took control and dominated the pair's discussions and actions.

The examples of more and less productive interaction patterns we identified have shown us that students engaged in inquiry are sometimes very skilled at navigating online text and, at other times, less so. Knowing that even the most skilled readers can benefit from targeted scaffolding, we have designed support materials that can be used to guide students as they read online collaboratively.

Teaching Ideas

Our examination of interaction patterns across four pairs of adolescent readers as they engaged in collaborative online inquiry highlights at least four areas of online reading comprehension that can benefit from focused teaching practices. The sections that follow offer teaching ideas that support peer collaboration in each important area. As a result of such teaching, it is likely that students will be adequately prepared to address the challenges posed to them by assessments designed to evaluate performance on the common core of language arts standards.

Planning and searching for information. As discussed earlier, students sometimes use flawed prior knowledge as the primary source from which to draw their goals and search terms. At the beginning of Palomita and Paige's search, they first recalled what they *thought* they knew about the topic, and then, one explained, "Now we think that we know our answer, so we're going to justify it by searching for something more specific to what we think it is." This approach to online inquiry reflects adolescents' tendency to seek online information that confirms their previous thinking rather than reading to integrate and assimilate conflicting information that may actually change their thinking or teach them something new.

When teachers encounter this pattern, directing students through an interactive process of comparing, contrasting, and integrating reliable information they find online with their prior knowledge can be helpful. This process is represented in Figure 1. As our analysis of more and less productive dialogue shows, the inquiry question should always guide initial and subsequent searches. Prior knowledge (PK) and new search results (S) must be integrated repeatedly to determine future search goals and search terms. As indicated in Figure 1, the integration process may consist of incorporating, or “adding” (+), information from search result 1 (S1) to PK, or it may consist of minimizing the influence of, or “subtracting” (-), information from their PK to better inform keywords used in future searches.

Many variables come into play in this planning and searching process, including the ability to determine Web site credibility, negotiate a lack of prior knowledge, and navigate an initial misunderstanding of the inquiry prompt. Initially, just-in-time coaching prompts from the teacher, along with the use of a graphic organizer to monitor old and new information, can support this process. Pairing a student who is less proficient with another who has stronger skills in these areas may also provide needed support. The goal of instruction should be to help students integrate what they know with what they are learning to strengthen future searches for relevant and reliable information. Guiding students to become more skillful in planning, searching, and integrating information they find with what they already know is likely to enhance content learning while also addressing a number of specific Common Core Standards (see the Locate column in Table 1).

Negotiating meaning. Whether reading offline or online text, we are constantly negotiating meaning. When reading on the Internet, multiple sources of information embedded into Web pages, hyperlinks, videos, animations, graphs, and charts are vying for

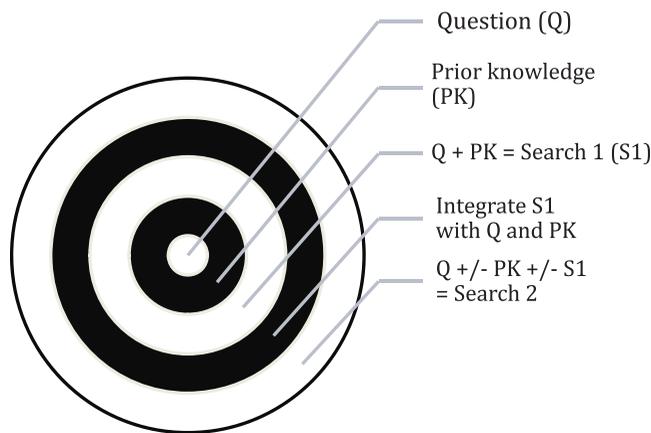


Figure 1. Targeting students’ planning and searching: A cyclical process of planning search terms informed by prior knowledge and information gleaned from previous searches

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attention. This increased complexity of text types and formats requires constant comprehension monitoring for optimal understanding.

When guiding students to read online to learn content, instructional procedures can support online meaning-making before, during, and after reading. Prior to reading, we have found it beneficial to explicitly introduce the inquiry question or task. This provides time for students to discuss their understanding of the task and an opportunity to ask for clarification about any part of the task. This discussion can take place in a whole group setting or among student pairs.

During reading, an online template or note-taking sheet can be distributed to help students document key ideas. We have found it helpful to build in check-in points during the inquiry process to help readers monitor their understanding of key ideas they encounter. Activities that ask students to classify and categorize their notes into like kinds of information are useful for scaffolding students through the process of sorting relevant information from irrelevant details and then synthesizing the most salient points across multiple texts. When reading collaboratively, responsibility for organizational note-taking tasks can be shared between partners. Alternatively, each student in the pair can take notes individually and they can later work together to organize their insights collaboratively.

A graphic organizer called 2P2R2SC is a scaffold specifically designed to support students as they preview and predict (2P), read and record (2R), synthesize and summarize (2S), and ultimately state their conclusion (C) while negotiating meaning during online inquiry. This graphic organizer encourages partners to use the graphic organizer to reflect on the inquiry prompt and pair-share their individual and jointly constructed interpretations of the texts they encountered online. This process will help students become more skillful in negotiating meaning before, during, and after reading. It will foster new knowledge-building while addressing a number of CCSS reflected in Table 1.

Determining relevant and reliable sources. In today's digital information society, it has become increasingly important for students to be able to determine the relevance and sufficiency of evidence found online to substantiate claims made by the author. Yet, this high level of thinking requires well-developed critical evaluation skills that adolescents in our study and elsewhere (e.g., Walraven, Brand-Gruwel, and Boshuizen 2009) seem to lack. Students who effectively determine relevant and reliable sources when reading online are able to read texts closely across repeated cycles of evaluation. These iterative cycles require students to compare, contrast, and judge the relevance and validity of claims as well as the authority of the source(s) making those claims (which, like other aspects of online inquiry, align with several Common Core State Standards in Table 1).

The thinking prompts listed in Figure 2 can be used to scaffold students through three key stages of critical evaluation: (1) examining the claims and sources in one Web site, (2) cross-checking the author's claims with at least two other reliable sources, and (3) deciding whether these additional sources suggest that the original author's claims are false or true. Questions that accompany these evaluation processes can encourage

<p>1. Examine the claims and sources in one Web site/document:</p> <ul style="list-style-type: none">a. Are some of the author's claims <u>relevant</u> to my question or problem? (Rank on a scale of 0–3)b. What are <u>two key claims</u> the author is making that are relevant to my question/problem?c. <u>Who</u> is making these claims? (one person, several people, one group, or several groups)d. <u>What level of expertise</u> does each author/group have to make these claims? (Rank on a scale of 0–3)
<p>2. Cross-check the author's claims with at least two other reliable sources:</p> <ul style="list-style-type: none">a. What evidence do I find elsewhere to <u>support</u> these claims? What expertise does this author have to make these claims?b. What evidence do I find elsewhere to <u>refute</u> these claims? What expertise does this author have to make these claims?
<p>3. Decide if these additional sources suggest the original author's claims are false or true.</p> <ul style="list-style-type: none">a. Consider the range of claims being made and the expertise of each source.b. Discuss with your classmates whether the set of claims represent equally valid, but <u>opposing perspectives</u> OR a collection of some claims that are valid and other claims that are <u>completely bogus</u>.c. Come to consensus about the quality of the claims being made and which information, if any, can be used to answer your original question.

Figure 2. Three stages of thinking prompts for evaluating sources.

readers to slow down and monitor their thinking at each stage. Jotting notes along the way enables students to later refer to both the texts and their notes as evidence as they discuss with classmates the quality of information encountered from various sources. False information sources can be blended with more accurate sources in math, history, and science to encourage students to check the reliability of sources they use during the inquiry process.

Synthesizing across multiple sources. Gathering information from multiple online sources and integrating new ideas into an original synthesis is another challenging aspect of online inquiry. Synthesis can be especially difficult for students if the newly encountered ideas are not consistent with their previous thinking (Alvermann, Smith, and Readence 1985). When reading on the Internet, adolescent readers often distort or disregard new ideas that contradict their thinking and revise their reading path to focus only on locating details that confirm their thinking. We have found that once students have seen the effects of this kind of thinking, they are ready to learn strategies to help them monitor these tendencies. The prompts in Figure 3 can help students: (a) recognize ideas they might otherwise ignore, (b) weigh the usefulness (and reliability) of these ideas against what they previously believed to be true, and (c) consider that the new ideas may actually be more accurate than their original thinking (see related CCSS in Table 1).

Conclusion

Examining more and less productive student dialogue collected as part of the collaborative learning process can provide a tangible means of visualizing the interchanges for which educators will soon be held accountable as performance-based assessments

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Directions: Use the following questions to help ensure your prior knowledge does not interfere with your ability to understand new information

1. My question is: _____
2. Before I begin searching, some things I know related to my question include:
 - a. _____
 - b. _____
3. After reading this new source, the author's most salient points are:
 - a. _____
 - b. _____
4. How does this new information compare and contrast with what I previously believed?
5. If I have read multiple sources, how does this new information compare and contrast with information I have found in other locations beyond my previous thinking?
6. Given this new information, what can I search for now to help me better understand the issue as a whole and determine which set of ideas is most accurate?

Figure 3. Thinking prompts for synthesizing disparate information across multiple sources.

of common core expectations begin to roll out in 2014. The teaching techniques in this article target the central areas where we have found that students need support during collaborative online reading of informational texts. These ideas can be easily adapted to a range of texts and teaching situations in ways that offer students useful guidance as they navigate resources and negotiate meaning of online texts. Our aim in offering these ideas is to help educators meet the call of the CCSS, while making strategic use of collaborative inquiry to harness the power of the Internet in ways that support content learning, critical thinking, and new knowledge generation for all students.

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