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"Tech-savviness" meets multiliteracies: Exploring adolescent girls' technology-mediated literacy practices

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About Me!!
Birth Date: 06/21/--
Favorite Foods: Orange Chicken. Steak and Eggs, RICE, and...PIZZA!
Least Fav Foods: Spinach, Squash, and **grins** Cavier. (I hate it so much I dun even know if that's how u spell it....) Oh, and sardines, too!
Fav Music: I like Rock, Techno/Dance
Least Fav Music: ACK! POP!! Like Spear Britney.... And the Backstreet Bums, and NSTYNC.... BLAH!
Hobbies: Drawing, building webpages, writing songs and fanfics, and stories. Hanging out with my buds, and my....
Boyfriend: Of course!! My bestest friend...! Scott!!

This is an excerpt from 13-year-old Rhiannon's biography on Fanimania, one of numerous websites she constructed that are related to her interest in *anime*—animated films and television series originating in Japan. Rhiannon's fandom (Alvermann & Hagood, 2000) served as the impetus for a good deal of her reading and writing, with much of it mediated by digital technology tools. This excerpt from her biography hints at a number of themes related to her online composing that we discuss later in this article, including the importance of popular culture, her experimentation with meaning-making resources beyond traditional print, and her use of tools such as the Internet to explore and express her perspectives on both gender and heterosexual romance. (All identifying information has been changed to protect the informants' privacy. Except where errors or idiosyncrasies might interfere with readers' comprehension, we have chosen not to edit the informants'

Tech-savviness meets multiliteracies: exploring adolescent girls' technology-mediated literacy practices

The purpose of this collaborative study between a university-based researcher and a teacher researcher was to explore early adolescent girls' use of digital technologies in their literacy practices. The rationale for the study stemmed from the lack of research considering (a) how adolescents employ technological tools for literate purposes in communities of practice beyond academic settings and (b) how constructions of gender might influence, as well as be influenced by, particular technology-mediated reading and writing practices. The New London Group's (1996) conception of Multiliteracies (cf., Cope & Kalantzis, 2000) and an activity theory-influenced framework (Beach, 2000; Cole, 1996; Engeström & Miettinen, 1999) were used to guide the study. Collected over an 18-month period, data included field notes from face-to-face interactions such as interviews, home visits, and school-based discussion groups as well as online documents and artifacts such as websites, listserv contributions, and e-mail messages. Data were analyzed inductively and recursively, with the two theoretical frameworks used as lenses in the later stages of that process. The technology-mediated literacy practices of two focal informants, both seventh-grade girls at the time of the study, are highlighted in this article. Two major themes emerged from data analysis: (a) the centrality of multimedia popular culture texts in the girls' technology-mediated Designing (New London Group, 1996) and (b) the importance of online relationships in mentoring the girls through the Design process. Implications for classroom teachers as well as researchers are discussed.

Manejo de la tecnología y "multi-alfabetización": Explorando las prácticas de alfabetización mediadas por la tecnología en muchachas adolescentes

Este estudio, realizado en colaboración entre una universitaria investigadora y una docente investigadora, se propuso explorar el uso que hacen las adolescentes de las tecnologías digitales en las prácticas de alfabetización. El fundamento del estudio fue la falta de investigación acerca de (a) cómo emplean las adolescentes las herramientas tecnológicas en prácticas de alfabetización llevadas a cabo fuera del ámbito académico y (b) en qué forma la construcción del género puede influenciar y ser influenciada por prácticas particulares de lectoescritura mediadas por la tecnología. La concepción de "multi-alfabetización" (*multiliteracies*, cf. Cope & Kalantzis, 2000) propuesta por el New London Group (1996) y un marco influenciado por una teoría de la actividad (Beach, 2000; Cole, 1996; Engeström & Miettinen, 1999) se usaron para guiar el estudio. Los datos, recolectados en un período de 18 meses, incluyeron notas de campo de interacciones cara a cara, tales como entrevistas, visitas a los hogares y grupos de discusión de la escuela, y también documentos *online* y recursos del tipo de sitios en la red, contribuciones a servidores y mensajes de correo electrónico. Los datos se analizaron inductiva y recursivamente, usando los dos marcos teóricos como lentes en los estadios más tardíos del proceso. En este artículo se destacaron las prácticas de alfabetización mediadas por la tecnología de dos informantes focales, ambas de séptimo grado en el momento del estudio. Dos grandes temas surgieron del análisis de los datos: (a) la centralidad de los textos de cultura popular multimedia en el diseño mediado por la tecnología usado por las jóvenes (New London Group, 1996) y (b) la importancia de las relaciones *online* para guiar a las jóvenes a través del proceso de diseño. Se discuten implicancias para docentes e investigadores.

Tech-Verständnis trifft auf Multi-Sprachausbildung: Untersuchen von technologie-beeinflussten Schreib- und Lesepraktiken jugendlicher Mädchen

Zweck dieser Gemeinschaftsstudie zwischen einem universitätswissenschaftlichen Forscher und einem Lehrer als Forscher war es, die Nutzung digitaler Technologien in ihrer Schreib- und Lesepraktizierung jugendlichen Mädchen zu untersuchen. Die Begründung dieser Studie stammt aus dem Fehlen von Untersuchungen, bedenkt man (a) wie Jugendliche technologische Hilfsmittel für literat-gestaltende Zwecke in kommunitiven Bereichen jenseits schulischer Gegebenheiten anwenden, und (b) wie geschlechtsbedingte Satzbaukonstruktionen beeinflussend wirken könnten, als auch durch bestimmte technologisch vermittelte Lese- und Schreibpraktiken beeinflusst sein könnten. Die Multi-Sprachausbildungskonzeption (vergl. Cope & Kalantzis, 2000) der New London Group (1996) und ein durch Aktivitäten-Theorien beeinflußtes System (Beach, 2000; Cole, 1996; Engeström & Miettinen, 1999) dienten als Leitfaden der Studie. Über einen 18monatigen Zeitraum zusammengestellt, enthalten die Daten Aufzeichnungen gegenseitiger Einflußnahme z.B. durch Interviews, Hausbesuche, schulisch begründeter Gruppendiskussionen, ebenfalls durch Online-Dokumente und deren Erzeugnisse, wie Webplätze, Listserv-Beiträge, und Email Mitteilungen. Daten wurden induktiv und rekursiv analysiert, unter Nutzung der beiden theoretischen Systeme als Fokus im fortgeschrittenen Prozessverlauf. Die technologievermittelten Schreib- und Lesepraktiken von zwei im Brennpunkt stehenden Informanten, beides Mädchen aus der siebten Klasse zum Zeitpunkt der Studie, werden in dem Artikel besonders beleuchtet. Zwei Hauptthemen gehen aus der Datenanalyse hervor: (a) die Zentralität der durch Multimedia verbreiteten Popkulturtexte im technologievermittelten Design der Mädchen (New London Group, 1996), und (b) die für die Mädchen wichtigen Bindungen der Online-Beziehungen bei der Tutorenhilfe im Verlauf des Designprozesses. Implikationen für Klassenlehrer als auch Lehrforscher werden diskutiert.

Piger la techno et rencontrer des littératies différentes: une exploration des pratiques de littératie par le biais des nouvelles technologies chez des adolescentes

Cette étude menée en collaboration entre un chercheur universitaire et un praticien chercheur avait pour but d'explorer comment les adolescentes utilisent les technologies numériques dans leurs pratiques de littératie. Le rationnel de la recherche a sa source dans le manque de recherches concernant (a) la façon dont les adolescents se servent des outils technologiques dans des buts de littératie dans des communautés de pratique au-delà des situations scolaires, et (b) la façon dont les constructions de genre peuvent influencer ou être influencées par certaines pratiques de lecture et d'écriture passant par ces technologies. On a pris pour guide de cette étude la conception des littératies différentes (voir Cope & Kalantzis, 2000) du New London Group (1996) et une structure d'activité influencée par la théorie (Beach, 2000; Cole, 1996; Engeström & Miettinen, 1999). Les données, rassemblées pendant plus de 18 mois, comportent des notes de terrain d'interactions en face à face telles que des entretiens, des visites à domicile, et des groupes de discussion en classe, aussi bien que des documents en ligne et des objets techniques tels que des sites web, des messages provenant de listes ou de courriers électroniques. On a analysé les données de façon inductive et récursive, les deux structures théoriques étant utilisées comme des loupes sur les dernières étapes de ce processus. Les pratiques de lecture-écriture passant par les technologies des deux informateurs, toutes deux en septième année au moment de l'étude, sont mises en lumière dans cet article. Deux thèmes majeurs ont émergé de l'analyse des données : (a) la centralité de textes de culture populaire dans l'utilisation que font les filles des technologies du Projet multimédia (New London Group, 1996), et (b) l'importance des relations en ligne dans le guidage des filles au cours du processus du Projet. On discute des implications tant pour les enseignants que pour les chercheurs.

online communication in order to present an authentic picture of their technology-mediated composition.)

We met Rhiannon when we began conducting literacy research with informants from her suburban middle school (see Chandler-Olcott & Mahar, 2001, 2003). More specifically, the purpose for that study—an 18-month collaboration between a university-based researcher (Kelly) and a teacher researcher (Donna)—was to explore how adolescent girls use information and communication technologies in their literacy practices, with a particular emphasis on practices beyond those sanctioned in formal academic settings. Our use of the phrase *literacy practices* is meant to signal our affiliation with what Gee (2000) called the New Literacy Studies—a movement "based on the view that reading and writing only make sense when studied in the context of social and cultural (and we can add historical, political, and economic) practices of which they are but a part" (p. 180). Like Moje (2000), we believe that literacy practices reflect "the values, beliefs, and actions that people bring to reading and writing" as well as the literate acts themselves (p. 21).

The research was grounded in our belief that consideration of adolescent girls' technology-mediated literacy practices could provide much-needed insights about how young people draw on meaning-making resources beyond the linguistic when constructing digital texts (Cope & Kalantzis, 2000; New London Group, 1996). It was also grounded in our interest in the influence of digital-tool use on adolescents' identity construction and sense of agency within particular communities of practice (Lave & Wenger, 1991; Wenger, 1998) or activity systems (Beach, 2000; Cole, 1996; Engeström & Miettinen, 1999). By gathering data in home and online contexts, we hoped to contribute to the growing body of literature on adolescent literacy that has moved beyond the classroom to provide new vantage points on adolescents' transactions with print and media texts (Alvermann, 2002; Finders, 1997; Gallego & Hollingsworth, 2000; Hull & Schultz, 2002; Moje, 2000). By paying close attention to gender in our analysis, we hoped to explore aspects of identity construction that have rarely been investigated in studies of adolescents' use of technology for literate purposes.

Our research questions included the following:

- In what ways and for what purposes do adolescent girls use digital technologies in their literacy practices beyond formal academic settings?
- How does their membership in various online communities of practice (Lave & Wenger, 1991) influence these technology-mediated literacy practices?
- How are constructions of gender implicated in the girls' technology-mediated literacy practices within these communities?

Theoretical perspectives and related literature

The research was informed by three bodies of literature: (a) the New London Group's (1996) conception of Multiliteracies; (b) sociocultural theories of mediated action and tool use; and (c) research on identity construction, gender, and technology. Each of these will be discussed in turn in this section.

Multiliteracies: Design and pedagogy

As digital technologies have become more central to daily life for many people over the past decade, researchers from disciplines such as reading, composition and rhetoric, and media studies have called for conceptions of literacy that address the impact of these technologies explicitly (Luke, 2000; Reinking, McKenna, Labbo, & Kieffer, 1998; Selfe, 1999; Watts Paillotet & Mosenthal, 2000). According to Bruce (1997), "the technologies of literacy are not optional add-ons, but are part of the definition of every form of literacy. Thus, a theory of literacy in a particular setting or community needs to incorporate an analysis of the relevant technologies" (p. 304).

Conceived by the New London Group (NLG), a collective of literacy researchers that first met in the United States in New London, New Hampshire, the Multiliteracies framework offers just such a theory. First in an article (New London Group, 1996) and then in an edited volume (Cope & Kalantzis, 2000), these scholars argued that rapid changes in people's work, public, and private lives necessitated a significant rethinking of literacy pedagogy. Their term *Multiliteracies* was meant to reference two elements of their vision: (a) "the increasing salience of cultural and linguistic diversity" in contemporary society and (b) "the multiplicity of text forms" associated with information and multimedia technologies (Cope & Kalantzis, 2000, p. 5). In laying out this framework, the New London Group sought to "reopen two fundamental questions," one related to "the 'what' of literacy pedagogy, or what it is that students need to learn" and the other related to "the 'how' of literacy

pedagogy, or the range of appropriate learning relationships" (p. 73). Both aspects have important implications for research on how digital technologies mediate adolescents' literacy practices in, and beyond, formal academic settings.

Design

As the central metaphor for what students need to learn about literacy, the New London Group offered the concept of Design. They suggested that any semiotic activity, including those mediated by technology, uses "Available Designs" (linguistic, visual, audio, gestural, spatial, and multimodal resources for meaning making) to create "The Redesigned," a new set of meanings. According to NLG members, this Designing process

> transforms knowledge by producing new constructions and representations of reality. Through their coengagement in Designing, people transform their relations with each other, and so transform themselves.... Transformation is always a new use of old materials, a rearticulation and recombination of the given resources of Available Designs. (New London Group, 1996, p. 76)

For these reasons, composition of any kind cannot be seen either as an individual, "creative" process or as a predetermined, social process but rather as a blend of both.

Related to this latter idea are two other important Multiliteracies concepts: (a) hybridity, defined as the articulation in new ways of "established practices and conventions," and (b) intertextuality, "the potentially complex ways in which meanings...are constructed through relationships" to other texts, discourses, genres, and modes of meaning (New London Group, 1996, p. 82). Both of these concepts are easily applied to transactions with digital texts. For instance, Luke (2000) provided an example of electronic "bookmarking" as a hybrid textual practice because marking a website for future reference maintains aspects of print-based technologies of literacy while introducing a new online element. In a similar manner, most websites invite their visitors to make intertextual connections—sometimes explicitly, through the use of links to other sources, and sometimes less explicitly, as in the case of a recent website spoofing George Bush's presidency that uses the same background and organizational structure as the official site at http://www.whitehouse.gov.

By emphasizing visual, audio, gestural, and spatial modes of meaning in the Multiliteracies framework, the New London Group (1996) underscored arguments made earlier by Eisner (1991) and Lapp and Flood (1995), among others, about the necessity for literacy pedagogy to attend to semiotic resources beyond traditional print. More specifically, NLG members Cope and Kalantzis (2000) argued that the privileging of linguistic meanings, especially written linguistic ones, should be seen as "increasingly anachronistic given recent social as well as technological trends in our communications environment" (p. 217). Given the importance of these trends, the New London Group argued for greater attention by educators to multimodality, an order of Design representing the "patterns of interconnection" (New London Group, 1996, p. 78) among the other five modes of meaning making. In their initial essay, NLG members claimed that all texts should be considered multimodal because even a traditional print text relies on elements of visual and spatial Design, as well as linguistic. This concept is fleshed out further by Kress (2000), who pointed out that multimodality can be viewed in at least "three distinct but related ways": (a) as a quality of all texts, (b) as a way to describe texts that emphasize modes other than language, and (c) as a term for "systems of communication and representation which are acknowledged in the culture to be multimodal" (p. 184).

While we acknowledge the broad point that all texts can be considered multimodal, we have chosen to focus on Kress's second and third conceptions of multimodality for the purposes of this study. We believe these are the applications of the term most likely to be associated in Western culture, particularly in schools, with digital texts and technologies. Luke (2000) also emphasized these conceptions in her discussion of how hypertext navigation privileges reading, writing, and communicating that are "not linear or unimodal (that is, exclusively language- or print-based)" because hypertext "demand[s] a multimodal reading of laterally connected, multi-embedded and further hotlinked information resources variously coded in animation, symbols, print text, photos, movie clips, or three-dimensional and manoeuvrable graphics" (p. 73).

A pedagogical framework

Helping students to explore and control the various aspects of the Design process, including these challenges of hypertext navigation, is the aim of the Multiliteracies pedagogical framework, the part of the theory emphasizing what the New London Group (1996) called the "how," rather than the "what," of literacy instruction (p. 73). NLG members argued that pedagogy should be seen as "a complex integration" of the following four components:

- Situated Practice, based on the world of learners' Designed and Designing experiences.
- Overt Instruction, through which students shape for themselves an explicit metalanguage of Design.
- Critical Framing, which relates meanings to their social contexts and purposes.
- Transformed Practice, in which students transfer and re-create Designs of meaning from one context to another. (p. 83)

According to Cope and Kalantzis (2000), all four components of the pedagogical framework are "necessary to good teaching" (p. 240) because each presents opportunities for student learning that the others do not. Situated Practice, for example, immerses literacy learners in a community engaged in authentic activity—an approach associated with progressive traditions that have been lauded for their attention to students' interests and choices but criticized for their lack of attention to cultural diversity and codes of power (Delpit, 1995). These limitations can be balanced with the combination of Overt Instruction, which helps to make concepts and theories explicit for learners, and Critical Framing, which helps learners to reflect on new knowledge and locate it in particular social, historical, economic, and cultural contexts. Similarly, one of the potential limitations of Critical Framing—that it might promote "critique isolated from practical action" (Cope & Kalantzis, 2000, p. 240)—can be overcome by its linkages with Transformed Practice, or opportunities for learners to transfer "knowledge gained in one context to another context" (p. 241).

Attention to all four aspects of the pedagogical framework has the potential to transform technology-mediated literacy instruction, because components such as Critical Framing and Transformed Practice can promote consideration of the social and cultural consequences of technology use that have often been overlooked in classrooms. Rather than focusing only on what Luke (2000) called "the 'functional' skills of keyboarding, file management, CD-ROM searching, and Internet browsing" (p. 73), literacy teachers who adopt a Multiliteracies perspective on technology integration also explore with their students how information and communications technologies change people's lives. In particular, they focus on the benefits and disadvantages of technology use for particular groups of people, as well as how those disadvantages might be overcome.

In addition to inquiries by the original members of the New London Group (Cope & Kalantzis, 2000), several literacy researchers have conducted empirical studies that were grounded, at least in part, in the Multiliteracies framework (Doherty, 2002; Kist, 2002; O'Brien, 2001; Smagorinsky & O'Donnell, 1998). These studies provided powerful evidence for the integration of multiple sign systems in instructional activities meant to promote adolescents' engagement in and skill with reading and writing. Several of them, most notably Doherty's (2002) inquiry into an after-school technology club for Aboriginal teens in Australia and O'Brien's (2001) study of multimedia composing in a U.S. high school's literacy lab, demonstrated the benefits of digital technologies being a part of the meaning-making repertoire for students often considered "at risk." All four of these studies, however, focused more on the Designing aspects of the Multiliteracies framework than the pedagogical components. For more insight about how adolescents adopt and adapt technological tools in social contexts, we turned to work beyond Multiliteracies.

Digital technologies as tools to mediate action

Some of the most interesting research with implications for technology use has been grounded in the perspective that learning should be seen as activity situated within communities of practice or activity systems (Beach & Myers, 2001; Cole, 1996; Engeström & Miettinen, 1999; Lave & Wenger, 1991; Wertsch, 1991, 1998). Some of these scholars identify themselves as activity theorists while others situate themselves more broadly within a sociocultural tradition. Although these schools of thought differ from one another on a number of points—most notably related to how units of analysis for research should be defined—they have more similarities than differences (Engeström & Miettinen, 1999; J. Lave, cited in Cole, 1996). All of these scholars owe a debt to Vygotsky and other Soviet psychologists for their work on the social nature of learning; all of them place an individual's actions in the context of broader historical and cultural factors; and, perhaps most important for a study focused on technology use, all of them emphasize the role played by tools, both material and psychological, in mediating human action and, therefore, human learning. To emphasize these connections, we use the terms *activity system*, defined by Engeström and Miettinen (1999) as "object-oriented, collective, and

culturally mediated human activity" (p. 9), and *community of practice*, defined by Wenger (1998) as a community "created over time by the sustained pursuit of a shared enterprise" (p. 45) as virtual synonyms here.

The use of the term *tools* in these frameworks can be contrasted with the limited sense of that term that is conventionally associated with technology. In particular, this more situated usage challenges the "autonomy myth" (Bruce, 1997) that separates technology use from learning or literacy and suggests that a technological tool (e.g., a template for building webpages or instant messaging software) can be seen as neutral, utilitarian equipment to be taken up or rejected by users with no cognitive or social consequences. Instead, these scholars view any technology, digital or otherwise, as one of the many symbolic resources that mediate what Wertsch (1991) called "higher mental functioning" (p. 21) and that participate in transactions with the other technologies, texts, discourses, procedures, and participants defining literacy in particular settings (Bruce, 1997). According to Wenger (1998), "Having a tool to perform an activity changes the nature of that activity" (p. 59) and participating in the changed activity always changes members of the community.

Activity theory offers an analytical structure for considering such tool use in relation to a number of other components of an activity system, including the object or purpose for participating in the activity; the rules, sometimes called the codes or conventions, for participating; the genres, sometimes seen as kinds of tools, on which participants draw; the division of labor among participants that takes place in order to achieve an object or purpose; and the identities participants define and construct through the activity. All of these components of the system exist dialectically with one another. As Beach (2000) pointed out, members' objects or purposes for participating in an activity system serve "to define the meaning of the tools they employ.... Tools are therefore used within an activity to function as extensions of certain ways of thinking in an activity" (pp. 5–6). The use of particular technological tools therefore mediates participants' pursuit of particular outcomes as well as construction of various identities. When tool use results in the achievement of outcomes that garner respect from other participants in the activity system, it serves to enhance users' sense of agency.

Some activity theorists argue that discourses, particular ideological perspectives operating within a social context, are another key component of activity systems, especially when researchers are interested in issues of language and literacy. Central to this position is Gee's (1996) notion of discourses as "identity tool kits," or ways of being, believing, valuing, interacting, using language, and using various objects, tools, and technologies to enact and maintain "socially situated" identities and activities. According to Beach (2000), activity theory-influenced analysis can and should consider how the discourses operating within an activity shape participants' responses to and engagement in that activity, as well as how participants are "positioned to adopt certain stances consistent with the discourses or ideological forces operating within the activity" (pp. 16–17). From this perspective, participants' tool use is always shaped by (and to some degree, shaping) the various discourses in the activity system, and researchers seeking to understand that tool use in deep, contextualized ways must examine and explore the discourses at work in the setting.

A number of studies have shown that more knowledgeable members of a community of practice or activity system socialize novice members into the use of technological tools. For example, in one of the largest scale studies of young people's digitally mediated literacies to date, Sefton-Green and Buckingham (1998) used multiple methods to gather data from British teenagers about their out-of-school use of multimedia technologies to produce "texts destined for consumption by others" (p. 63). These researchers found that "initiators," friends and relatives who were often older and usually male, played an important role in launching and sustaining informants' use of multimedia software. In an ethnography of "everyday literacies," Knobel (1999) showed how Nicholas, an adolescent who was often passive and distractible as a computer user at school, received assistance at home from his mother that helped him use the family's word-processing software to organize and develop his writing. Tobin (1998) profiled Isaac, his teenage son, whose website on a fantasy war-playing game called Warhammer 40K received about 500 hits a week. As an *otaku* (a term from Japanese youth culture for someone who uses his computer skills to pursue a consuming interest in popular culture), Isaac provided support and information to other Warhammer enthusiasts; at the same time, he benefited greatly from a relationship with a family friend who worked as a systems engineer and provided carefully gauged support to Isaac when the boy faced online design challenges that were beyond his knowledge and experience.

The most sustained example of scaffolding related to technological tool use and literacy, however, comes from more than a decade of activity theory-influenced research on the Fifth Dimension, a

network of after-school enrichment programs for young people that mix game playing and the use of online technologies with literacy development (Blanton, Greene, & Cole, 1999; Cole, 1996; McNamee & Sivright, 2002). Central to the activity in every Fifth Dimension site is the "Wizard"—a fantasy figure who communicates with participants through telecommunications. The Wizard provides a "common authority figure to whom all are accountable" (McNamee & Sivright, 2002, p. 170) while simultaneously helping with its playful persona to blur the line between fun and work. College student volunteers, or "Wizard's Assistants," also scaffold participants' learning by helping them to read cards describing various tasks and by assisting them on an as-needed basis to compose both print and digital texts related to these tasks. While these volunteers are more skilled and experienced at reading and writing than the children, Cole (1996) pointed out that many of them receive help from participants in negotiating the procedures of particular games—a finding that suggests that expertise related to tool use in an activity system does not always flow from older to younger participant.

In addition to helping novices learn to use technological tools, communities of practice or activity systems often establish standards for technology-mediated products that promote work of a certain quality on members' parts. On the simplest level, such tools often make it easier for young people, including those with disabilities, to produce neat and attractive multimedia texts (Wilhelm, Friedemann, & Erickson, 1998). Some technologies also widen the audience for these texts, creating a greater sense of urgency for the designers and motivating them to put forth their best efforts (Eagleton, 1999; Pirrone, 1998; Wilhelm et al., 1998). Furthermore, the tools themselves often provide opportunities for feedback from other members of the community of practice, either through electronic mail (Pirrone, 1998) or multimedia authoring tools such as StorySpace (Myers, Hammett, & McKillop, 2000).

Finally, certain kinds of technological tools facilitate their users' inquiry into various communities of practice or activity systems, often through the integration of multiple modes of meaning (Beach & Bruce, 2002; Beach & Myers, 2001; Giles, Macaul, & Rodenberg, 2000; Myers et al., 2000; O'Brien, 2001). For instance, O'Brien found that students previously seen as "at risk" were repositioned as capable literacy learners within a school-based community of practice that valued the combination of art and media texts with print and encouraged the use of digital tools to create multimedia biographies. Adolescents in Beach and Myers's (2001) study used digital tools to represent their learning from inquiries into the various social worlds to which they belonged; in a notable example, one young woman took photographs of her friends, then colorized certain sections of the photos using digital tools to make powerful points about discourses of individual differences and belonging. In their report of seventh graders' use of multimedia software to create poetry anthologies, Myers et al. (2000) cautioned that such tool use does not guarantee that users will take a critical stance in their multimedia authoring. Nonetheless, their work demonstrated the possibilities for collaborative "negotiation of meaning" (p. 90) as students used the tool to integrate multiple sign systems or Designs of meaning (New London Group, 1996). In each of these cases, technological tools helped students to ask and answer their own questions about various texts and communities.

Identity construction within communities of practice: Focusing on gender and technology

In addition to their emphasis on tool use, another central premise of theorists exploring mediated action within communities of practice or activity systems is that identity construction takes place within the context of practice or joint activity (Beach, 2000; Cole, 1996; Lave & Wenger, 1991; Wenger, 1998; Wertsch, 1998). According to Wenger (1998),

> Building an identity consists of negotiating the meanings of our experience of membership in social communities. The concept of identity serves as a pivot between the social and the individual, so that each can be talked about in terms of the other. It avoids a simplistic individual-social dichotomy without doing away with the distinction. (p. 145)

In this view, the process of building an identity is continuous, and it is influenced by our membership in numerous communities of practice, some of which, as Wertsch (1998) pointed out, have multiple, even conflicting, purposes. In a similar vein, Beach (2000) argued that activity theory-influenced perspectives can be used to examine how readers, viewers, and composers of media texts "construct their identities within the competing contexts of their own immediate, local activity, as well as within the larger context of a virtual media world" (p. 13).

It is unfortunate that much of the work on young people's use of technology to date has paid little attention to issues of identity construction. Studies in this area have tended to focus on how technological

tools are used to complete various tasks, not how community membership influences this tool use or how tool use relates to individuals' constructions of selfhood. One of the aspects of identity construction that has been most ignored in technology-related research is how constructions of gender shape and are shaped by individuals' use of particular technological tools within particular contexts.

This is not to say that there has been little work on the intersection between gender and technology—quite the contrary. Researchers interested in these two topics have reported gaps between girls and boys in terms of their interest in technology, enrollment in college programs with a technology focus, and employment in technology-related fields (Gerver, 1989; Gomez, 1991). Differences associated with gender have been identified in the ways that males and females perceive high-technology use by others (Cassell & Jenkins, 1998), conceptualize potential uses for computers (Giacquinta, Bauer, & Levin, 1993), view and play computer games (Alloway & Gilbert, 1998), and participate in electronic networks (Beach & Lundell, 1998).

Perhaps the most influential of these studies on gender and technology is *Tech-Savvy*, a study commissioned by the American Association of University Women (AAUW). Among the striking findings of this report (American Association of University Women Education Foundation, 2000) were that girls viewed the computer culture as narrowly focused, disliked the violence and isolation of computer gaming, and often expressed what the commission characterized as an "I can, but I don't want to" attitude (p. 7) toward use of technology. Commissioners speculated that girls' preferred ways of participating in the culture of computing—the use of productivity software such as PowerPoint instead of the development of programming skills, for example—could disadvantage them in the world of work. They argued that certain kinds of computer application courses had become the "new typing class" for girls and recommended that K–12 education focus instead on producing both female students and classroom teachers who were "tech-savvy," that is, those with the abilities to

> apply information technology in sophisticated, innovative ways to solve problems across disciplines and subject areas; to interpret vast amounts of information with analytic skill; to understand basic principles of programming and computer science fundamentals; and to continually adapt and learn new technologies as they emerge in the future. (p. x)

Although all of these studies, including the AAUW's, raised some provocative issues about gender and technology for educators, nearly all of them had limitations. Most important from an identity construction perspective was that they tended to essentialize gender, treating it as a unitary, stable variable despite evidence that people enact it more fluidly in their lives (Orellana, 1995; West & Zimmerman, 1987). Informants were categorized as simply male or female, without consideration of the range of ways that individuals experience gender in different contexts. They also tended to rely on data-collection methods such as questionnaires and one-time group interviews that make it difficult to consider the complexities, and contradictions, of identity construction over time.

Also problematic was the fact that only a few of the studies dealt with literacy directly. Instead, most attended to technology use in general, without considering how constructions of gender might influence or be influenced by particular reading and writing practices. In doing so, they privileged computing applications most appropriate to traditionally male-dominated disciplines such as math and science, relegating tools and strategies associated with English language arts to second-class status and discounting the complexity of semiotic manipulation with technological tools that is emphasized by literacy frameworks like Multiliteracies (New London Group, 1996).

Two recent reports present examples of research on adolescents' use of technology that deal with literacy specifically and avoid essentializing gender. Although neither drew explicitly on theories of tool use mediating human action, both were grounded in sociocultural perspectives that Gee (2000), a New London Group member, argued are compatible in important ways with both Multiliteracies and activity theory. The first of these studies, Lewis and Fabos (1999), revealed how two adolescent girls used instant messaging (IM) technology to solidify social networks with peers and negotiate multiple identities online—at times even writing through a male persona in order to gain information related to their romantic relationships. In a conclusion similar to one made by O'Brien (2001), these authors contrasted the "sophisticated rhetorical choices and critical analyses" associated with IM interactions with the "simply linearity of the writing process as it is often represented" in literacy classrooms (p. 10). Duncan and Leander's (2000) inquiry into adolescent girls' Internet homepage construction sponsored by gURL.com demonstrated that online publishing can be a source of power and agency for young women while at the same time implicating them in traditional ideologies about gender. Feedback on their writing from people with no vested interest in their "real-time" lives, for example, appeared to be

very motivating for the girls. But at the same time, their participation as writers in this online community meant that their texts were linked to other pages whose commercial sponsors were "in the business of constructing discernible oppositions between masculinity and femininity in order to establish distinct marketing groups" (Duncan & Leander). For this reason, Duncan and Leander called for the development of a "pedagogy of critical website interpretation and evaluation" that "moves far beyond traditional categories of evaluating informational texts" to consider how websites position readers and writers. Both of these studies suggest what rich insights can be provided by literacy research that focuses on young people's use of various technological tools while attending explicitly to the relationships between gender and identity construction in those online contexts.

Rationale for the study

The study described here was situated at the intersection of these various trends and meant to address, at least preliminarily, these gaps and limitations. Although previous studies have been grounded in aspects of the Multiliteracies framework, the focus in those studies was primarily on the concept of Design. While attending to issues of Designing, this study goes further than those previously discussed to attend to the four components of the Multiliteracies pedagogical framework: Situated Practice, Overt Instruction, Critical Framing, and Transformed Practice. The case studies presented in this article address the simultaneous and interconnected aspects of these pedagogical elements as well as their relationship to our informants' technology-mediated literacy practices.

The study also takes advantage of sociocultural theory, most specifically activity theory, which considers tool use within communities of practice. Many of the studies in this tradition that have examined technological tools did so within spheres of influence where adults were the central members of the community. Often times these adults held positions of power and authority in the adolescents' real-time environment. In contrast, by examining the communities of practice our adolescent informants sought out on their own, we are able to consider how learners are apprenticed to technological tools outside formalized settings mediated by adults from their schools or families. We were also able to examine how the choices made by our informants within these communities of practice transformed our informants, the community, and the tools themselves.

Furthermore, the study was meant to explore ways that research on adolescent girls' technology-mediated literacy practices could offer important insights about the role of digital tool use in adolescents' construction and maintenance of their identities, including, but not limited to, their gender identities. By studying particular girls' practices in specific contexts, we sought to move beyond discussions of technology use that either assume masculinity as the "invisible norm" (Cassell & Jenkins, 1998, p. 25) or essentialize girls' experiences stereotypically. We also hoped to explore the range of girls' technology-mediated reading and writing, avoiding the kinds of unproblematized comparisons of boys and girls that, as Orellana (1995) pointed out, often blind researchers to within-group variation.

Method

The study was a hybrid one, blending traditional qualitative (Spradley, 1980) and teacher-research (Hubbard & Power, 1999) approaches. Donna (second author) is a seventh-grade English teacher who gathered data from her interactions with students in classes, study hall, and before- or after-school activities. Kelly (first author) is a university-based researcher and teacher educator who spent one or two days a week in Donna's classes and study halls, where she made observations and interviewed informants about their technology use. Kelly also conducted home visits with informants and their families. Conceptualization of the study, data analysis, and the writing of this article were collaborative.

Context for the research

The research took place with informants attending a suburban middle school in upstate New York. More than 95% of the students were of European American descent. Although only about 10% of them received free or reduced-price lunch, the community was mixed in terms of socioeconomic status. A school guidance counselor estimated that about one sixth of the students had parents with professional occupations; one third had parents employed in white-collar jobs in business and service industries; one third had parents in blue-collar jobs; and one sixth lived in foster placements, homes where parents were unemployed, or custodial placements with relatives (Field notes, September 11, 2000). Access to technology was clearly valued by most parents in the community regardless of occupa-

on, as 94.5% of students in Donna's five English classes reported having access to a home computer.

Students' access to technologies in school was largely determined by which teachers they had and by those teachers' familiarity and comfort level with those technologies. The school had a limited number of computers available for student use, and only some of these—in the library and in a few classrooms—had access to the Internet. Online activity was regulated by a filter that did not allow access to popular search engines such as Ask Jeeves, nor did it allow users to access many of the chat rooms, role-playing games, and page-building sites that were central to some students' technology-mediated literacy practices outside school. Formal instruction related to the Internet tended to focus more on locating and evaluating information from websites than on composing online texts.

Participants

Initial participants for the study included 12 seventh- and eighth-grade girls who used one or more digital technologies proficiently or frequently in their literacy practices beyond school. They were identified as possible informants by the following: (a) their responses to an informal survey about their technology use; (b) analysis of school-related products that incorporated technology; and (c) conversations about technology use in classes, study halls, and extracurricular activities. For our purposes, establishing levels of proficiency was less important than ensuring that the pool included girls who used different technologies in different ways. While all participants were female and of European American descent, they varied in terms of socioeconomic status, academic achievement, and position in the peer culture.

Two girls, Rhiannon and Eileen, were selected as focal informants for a number of reasons. Both reported using the Internet frequently, usually daily, in their literacy practices beyond formal academics, and both expressed a high degree of interest in talking with us about those literacy practices. Their shared passion for Japanese animation made it possible to compare the popular media sources that influenced their composing, but they used digital technologies to enact their fandom (Alvermann & Hagood, 2000) in different ways. Rhiannon composed fanfictions (stories drawing on characters and settings from popular texts) and constructed personal webpages, while Eileen drew fan art (the visual equivalent of fanfictions) and participated in an electronic mailing list for aspiring artists. These activities involved both girls in technology-mediated Designing that explicitly required them to consider spatial and visual modes of meaning as well as linguistic ones. For this reason, their activities raised questions for us that the use of largely text-based technologies such as electronic mail—common among nearly all of the girls in the sample—did not. In addition, both girls received a good deal of mentorship related to their technology use and their composing processes from other members of their online communities—an issue we wanted to explore in the context of the Multiliteracies pedagogical framework as well as in light of activity theory and work on communities of practice.

Our selection process was also influenced by the students' stances toward technological tools. Rhiannon was the only girl in the sample to teach herself programming languages such as Hypertext Markup Language (HTML) and JavaScript. In addition to her desire to construct particular products, she wanted to know how these tools worked for their own sake because of her interest in becoming a game programmer. Because she was interested in customizing and manipulating her tools, her technology use was more in line with the AAUW's (2000) recommendations for girls than Eileen's, which tended to be more concerned with what a technology could *do* rather than how it worked. Eileen's stance toward the tools she used was more characteristic of our other informants. Considering both cases together, therefore, allowed us to explore differences among the girls that might have been lost in a study reporting between-sex differences or general trends across our entire sample.

Data collection

The following data on Rhiannon and Eileen's technology-mediated literacy practices were collected over 18 months:

- field notes from formal and informal interviews with both girls, some of them at Internet-connected computers;
- field notes from informal interviews conducted by Donna with the girls' teachers;
- field notes kept by Donna related to the girls' participation in an informal, technology-focused discussion group that met in study hall during the fall of 2000;
- field notes from home visits Kelly made to both families in May and June, 2001;
- artifacts (e.g., school assignments, fanfictions, drawings) given to us by both girls;

- printed copies from websites the girls visited or, in Rhiannon's case, constructed;
- copies of messages and attachments Eileen posted or received through membership in an online artists' group; and
- e-mail messages exchanged by both girls with Kelly.

Although some of these data were school based (e.g., Donna's field notes from the study hall group), our purpose was to explore the girls' use of technology outside of formal academic settings. For this reason, we did not conduct participant observation in their classes. We did, however, interview the girls' core-subject teachers regarding their perceptions of each as students, and we asked Rhiannon and Eileen during a number of interviews to talk to us about their experiences in school and their impressions of classroom literacy tasks. On occasion, we were able to make copies of our notes about school-related artifacts while interacting with the girls. One notable example of this comes from a conversation Kelly had with Rhiannon about an anthology of poetry that Rhiannon wrote and compiled for her English class. The scoring criteria for the assignment emphasized neatness, completeness, and the following of syllabication and rhyme rules for forms such as the haiku and the cinquain. We were interested to see that Rhiannon chose to handwrite it, despite her use of word-processing software for her personal writing. In a similar manner, Eileen shared with Donna a handwritten practice essay that she had done in social studies class to prepare for a state examination. Like the poetry anthology, this assignment privileged traditional print genres—in this case, the five-paragraph test response—and encouraged students to write with an external auditor in mind. These interviews and artifacts confirmed prior knowledge of the school context we had suggesting that technology was rarely integrated into instruction and that academic literacy was often constructed as following scripts established by the teacher. While we did not collect this material for the purpose of comparing the students' in- and out-of-school literacies directly, it did give us a richer sense of school as one of the influences on both informants' Designing, as well as one of the multiple contexts in which they constructed literate identities.

Data analysis

As is recommended by scholars of qualitative and teacher research (Hubbard & Power, 1999; Spradley, 1980), we coded and analyzed data continuously and recursively. We began inductively, with each of us examining transcripts, field notes, and artifacts independently and tape-flagging interesting snippets of data to share with each other at our semi-monthly research meetings. We also relied on taxonomies and other graphic representations of data (Spradley) to help us reduce the data and begin to consider patterns. Several months into this process, after we had identified the two girls as focal informants from the larger pool, each of us reread all of the data associated with the girl with whom we had interacted the least (i.e., Eileen for Donna, Rhiannon for Kelly). This strategy was meant to immerse us in data we had not necessarily collected personally. Then, each of us wrote a preliminary outline of a case narrative to the other person about patterns we observed across the data set. Discussion of these two documents and subsequent further coding of the data led us to identify preliminary themes including, for example, the influence of multimedia texts from popular culture on the girls' composing, the boundaries the girls saw between their online literacy practices and school-sponsored literacy, and the importance of online mentors in their learning to use digital tools. These insights, combined with our regular discussions of conceptual and theoretical work on literacy and technology that we were reading together, helped us to settle on the theoretical lenses that we subsequently used in the study.

Throughout this first phase of the research, we used continuous written dialogue as a way to deepen our understandings. Our e-mail correspondence amassed 317 pages, and we wrote more than 20 formal memos to each other. As we reread the original data and our own reflective writing, we kept a running list of follow-up and clarifying questions to ask both informants, and we reinterviewed them periodically with that list as our guide. When Rhiannon moved to another state about two thirds of the way through our data collection, this process became more difficult, but we used e-mail as a way to gather additional data and cross-check conclusions with her to ensure that we were understanding aspects of youth culture that were foreign to us at the start of the study.

We also used our theoretical lenses to sensitize us to particular patterns in the data. For example, once we established webpage construction and mailing-list participation as two central pursuits, respectively, in Rhiannon and Eileen's lives, we examined the data related to each using an activity theory-influenced framework (Beach, 2000; Cole, 1996; Engeström & Miettinen, 1999). We coded for various components—object/purpose, tools, genres,

FIGURE 1
NOTES ON EILEEN'S PARTICIPATION IN THE ANIME MAILING-LIST ACTIVITY SYSTEM

Object/purpose
- To get feedback on her work and improve as an artist
- To connect with a community of friends outside of her middle school
- To construct joint narratives about characters as a fan

Tools
- Colored pencils and paper
- Computer and scanner
- Electronic mail
- Commercial newsgroup that hosts list
- Zelda's homepage, as "portal" to the list
- Emoticons, both Japanese and American

Text genres and forms
- Science fiction/fantasy/"mecha" anime shows (e.g., *Escaflowne*, *The Slayers*, *Digimon*)
- Fanfictions
- Webrings (e.g., a connected set of websites devoted to the character Phibrizzo)
- Shrines (e.g., Dilandau's Lair)
- How-to guides
- Electronic mail

Identities
- Anime/manga fan
- Artist
- Consumer of popular media texts (e.g., *X Files*, "Yellow Submarine," http://www.ozzy.com)
- "Precocious kid"
- Heterosexual female

Division of labor
- List was initiated and is maintained by Zelda, who selected the commercial service to host it
- All members posting anime-art-focused messages and attachments
- Refocusing of the list is done by Zelda, though sometimes less officially by more experienced members, especially those who are professional graphic artists
- More tech-savvy members socialize others into how to use various technologies (e.g., links, attachments) to send and view art

Codes/conventions
- Putting a clear subject in a mailing list message helps people tell what is relevant to them
- Better, more experienced artists often receive more messages
- Newcomers to the mailing list receive welcome messages from established members
- Contributors don't usually include their real-life addresses
- Art attachments need to be a certain size to be handled by others
- Members create and send pictures to one another of favorite characters from established shows or the recipient's original characters

identities, conventions/codes, division of labor, and discourses—of both activity systems. Figure 1 provides an example of the charts we created to represent this layer of analysis. Although we chose not to use the framework to structure our reporting of results, we have interspersed attention to these components throughout the sections that follow.

Because of its explicit attention to the demands of Designing in digital environments, we relied most heavily on the Multiliteracies framework (Cope & Kalantzis, 2000; New London Group, 1996) as an analytical tool. We examined both girls' cases to see how they drew on various modes of meaning (e.g., linguistic, audio, spatial) in the Designing process (see Figure 2 for a sample chart that summarizes some of these issues related to Rhiannon's webpage construction), as well as the degree to which the technology-mediated texts they created demonstrated characteristics such as intertextuality and hybridity. As we identified patterns and themes related to our focal informants' Designing, we used the four components of the pedagogical framework—Situated Practice, Overt Instruction, Critical Framing, and Transformed Practice—to analyze the opportunities the girls had within particular communities of practice (Lave & Wenger, 1991) to learn about and with digital technologies (see Figure 3 for an example of this analysis related to Eileen's participation in an art-focused mailing list). As we had in earlier stages of the process, we wrote memos to each other about patterns that we observed. We eventually decided to use Multiliteracies as a way to organize our results related to each informant, with one part of each case study devoted to the girls' Designing process and the other to issues of mentorship and pedagogy related to that Designing. This multistep inquiry process,

FIGURE 2
SAMPLE CODING RELATED TO RHIANNON'S USE OF VARIOUS MODES OF MEANING IN HER WEBPAGE CONSTRUCTION

Visual	Gestural	Spatial	Audio	Linguistic
Uses mostly bright colors, including a lot of pink in her sites	Keeps her body close to the screen when composing online, blocking other viewers' visual access	Uses repeating images of anime characters as backgrounds, unifying pieces of the site	Subvocalizes frequently while composing online	Uses HTML as a language; knowledgeable about various codes
Imports images of anime characters from other sites, including many of women with exaggerated femininity	Incorporates lots of verbs with stars ("*hugs* PeekiePoo," "*grins* cavier") to demonstrate gestures and physical action in online composing	Links for most sites are organized along left side of the page, in a list	Uses opening music to one site that is generic in nature with no ties to anime subject matter	Signs her own dreambook with pseudonym to encourage others to visit her site
Includes scanned photographs as well as cartoon images of males in bishonen gallery	Stakes out "her" computer in classroom with body language to gain best Internet access	Incorporates tables in her help site to aid in comparison of information	Includes link to anime song source in one site	Writes poems and fanfictions about romance using anime characters
Uses font types, sizes, and colors for emphasis in print text	Poses of various anime characters communicate emotion	Improves overall organization of site when she borrowed layout from Lunamoth Designs	Refers to need to sing on phone for site visitors to avoid copyright violation	Uses direct address in introductory sections of site to engage reader

beginning with inductive analysis and then moving to theoretically driven passes through field notes, transcripts, and artifacts, allowed us to stay close to the students' own perspectives while at the same time applying theoretical frameworks that foregrounded issues of interest to us related to technology-mediated literacy practices.

Results

This section presents themes and patterns related to Rhiannon and Eileen's data using parallel structure. We focus each case on the technology-mediated activity (Beach, 2000; Cole, 1996; Engeström & Miettinen, 1999) in which each girl participated most often: construction of anime-focused webpages for Rhiannon and participation in an anime art-focused mailing list for Eileen. After a brief introduction to each girl, we present our findings in two sections: one considering the Designing process (i.e., the ways each girl used Designs of meaning in her technology-mediated texts), and the other considering mentorship and pedagogy (i.e., the kinds of informal and formal instruction or support each girl received related to her participation in that community of practice or activity system).

Rhiannon: Constructing anime-focused webpages

Rhiannon lived with her mother, a nutritionist, and a younger sister in an apartment complex about a mile from Oakwood Middle School. Described by an Oakwood teacher as a "good student" but one "who does not open up" (Field notes, February 27, 2001), Rhiannon did not participate in any school-sponsored activities. She spent most of her time out of school with her church group or pursuing online activities, on which she estimated spending two or three hours each day. Her technology-mediated literacy practices included sending e-mail and instant messages to friends in other states, participating in chat rooms and online role-playing games, and writing fanfictions. Her primary technology-related pursuit, however, was constructing webpages on anime-related themes.

Rhiannon was one of the few students we knew who accessed the Internet through WebTV. She explained the family's decision to adopt this system, which uses a keyboard with an infrared sensor to control activity on the television set, was due to her mother's desire to avoid the hassle of product upgrades. During Kelly's home visit, however, Rhiannon's mother described it as strictly an eco-

FIGURE 3
A SAMPLE OF CODING RELATED TO EILEEN'S CASE USING THE MULTILITERACIES PEDAGOGY FRAMEWORK

Situated Practice	Overt Instruction	Critical Framing	Transformed Practice
Is able to participate in the mailing list as an observer and provider of feedback before she receives her scanner	Experienced members explain how to send attachments to the list so others can handle them	Discusses differences she sees in how Americans and Japanese people deal with controversial topics in cartoons	Introduces her own characters to the mailing list and others begin to draw them, using their own style
Reports learning about other contributors' Visual Design choices from observing their work online	Zelda provides explicit information about what skills a graphic designer needs to have in an online interview for Home and Careers class	Explains how an anime character's "bouncing orbs" serve as his "sign"	Provides more specific and detailed critique on a member's attempt at realism while still employing supportive language
Picks up language from the mailing list, both Japanese terms such as *bishonen* and abbreviations such as CNC	Learns more about lines and shading from Zelda's online art tutorials	Begins to self-evaluate her work in terms of its strengths and weaknesses in her online requests for feedback	Begins to make reference to her interests in popular music and film in her mailing-list postings and artwork
Sends postings and artwork to the mailing list that focus on her personal anime characters	Postings to the mailing list are "reshaped" by Zelda when she's off topic	Explores gender representations in her art: "Does this look too feminine?"	Begins to give anime-art lessons to younger peers at school
Sends "drafts" of artwork to the mailing list for feedback before submitting them to contests	Attaches a sketch of something she's trying to demonstrate with words in a critique of another member's work	Identifies certain physical characteristics of anime characters as meant to appeal to a young male audience	Seeks online feedback from Mr. Worthy, an established artist, using methods and language she developed from mailing-list participation

nomic decision, explaining that the set-up costs and monthly fees for WebTV were significantly less than those for a conventional computer (Field notes, June 12, 2001).

WebTV gave Rhiannon access to a community of other anime fans online. As a tool in this activity system, WebTV privileged certain kinds of activities and curtailed or prohibited others. It did not permit access to Eternal City, a favorite game Rhiannon played online at school during study hall or before her classes. Nor did it allow her to use America Online's instant messenger service—an activity representing the same kind of social capital for many Oakwood seventh graders, especially girls, that it did for Lewis and Fabos's (1999) adolescent informants. On the plus side, WebTV's chat rooms helped Rhiannon to connect with peers who shared her interests, and it provided her with free space to build multiple websites.

When the study began, Rhiannon had developed more than a dozen homepages, a number of which were incomplete. A year later, all but one of those sites had been deleted—casualties of Rhiannon's decision to change her screen name—but she had constructed four more. Several of these were unfinished, with links that did not lead anywhere or notes that she would post more content later. Like the informants in Sefton-Green and Buckingham's (1998) study of British teenagers' creative uses of technology (many of whom failed to complete particular multimedia projects they began), Rhiannon did not seem concerned by her unfinished products. Nor did she seem to mourn the loss of those websites attached to her previous screen name. She told Kelly that she could easily make other sites.

In addition to her home usage, Rhiannon orchestrated her school life in ways that provided her with extra time online. Once she became aware of Donna's interest in girls' use of technology, Rhiannon began to have her mother drop her off at school one hour before the school day officially began. Ostensibly, this was to help Donna with the study and to do her homework. In reality, Rhiannon saw these early morning sessions as a way to gain access to websites that were not available through WebTV. During her study hall with Donna every other day, Rhiannon usually arrived early to claim the one computer in the room hooked up to the Internet. She used the same strategy in another study hall she had on alternate days. Just as she could not

access some websites from home with WebTV, some sites she visited at home were unavailable at school. For example, Tripod, the host for most of her own webpages, was blocked by the school filter a few weeks after she first accessed it from Donna's classroom computer. The limitations Rhiannon faced in both locations caused her to devise innovative strategies for tool use—for example, sending images she found during Web searches at school to her home e-mail address—to circumvent them.

Like the computer tinkerers studied by Turkle (1995), but unlike most girls in our study, including Eileen, Rhiannon wanted to know how various technological tools worked, not simply how to follow procedures and use them. For this reason, she scorned commercial services like Express Page (http://www.expage.com) that were popular with other students, especially the high-status girls in her grade, because they allowed users who did not know HTML to build homepages from templates. Although she expressed concern that certain peers who knew about her technology expertise would see her as a "geek," she also took satisfaction from her belief that she was the "only techie in this school who's a girl" (Field notes, February 7, 2001). Aware of various discourses associating computing with boys and men, she wrote, "In a way, I think I'm conquering a majorly male dominated field. And I feel proud because of it" (E-mail, April 4, 2001). In this way, her technological tool use was associated with the construction of a gendered identity, often in contradictory ways: It pleased her to see herself as an agent who was breaking gender boundaries, and yet she believed that school peers' knowledge of her skills would position her negatively and make her less desirable as both a friend and a potential romantic partner for boys. The online Designing that she did made it clear that this latter concern was important to her.

Technology-mediated Designing

Rhiannon's anime fandom provided her with raw material—visual, linguistic, and spatial Designs of meaning—for her online composition. It also provided her with what activity theorists call an object or a purpose for that authorship: in this case, to communicate with and connect to other WebTV-using anime fans. To that end, her websites featured various fan-related elements where, for example, visitors could comment on which anime characters they most admired or download images from picture galleries of *bishonen* (a Japanese term anime fans use to refer to male characters they find physically attractive). Several sites also featured fanfictions (i.e., episodic stories Rhiannon wrote using characters and settings from favorite cartoons and video games; Chandler-Olcott & Mahar, 2003).

Because these stories incorporated material from existing media texts, they made the intertextuality of Rhiannon's writing clearly visible. In fact, readers' ability to construct meaning from her fanfictions depended on having a certain level of familiarity with the anime texts that inspired them, because Rhiannon rarely gave much attention to setting, character descriptions, or back story. Melding characteristics of numerous genres, including fantasy, science fiction, "teen buddy" movies, and romance, Rhiannon's writings also provided good examples of hybridity, the New London Group's (1996) term referring to the creation of new meanings and new genres through Designing. The fanfictions themselves were hybrid texts, but so were the websites in which they were included, because the sites blended elements from genres such as plot synopses, scrapbooks, and fan magazines, all for the purpose of expressing Rhiannon's fandom and interacting with other fans.

As she "borrowed" Available Designs for these online compositions, Rhiannon confronted a number of complex issues about the nature of authorship, particularly as she integrated images (visual and spatial modes of meaning) with print text. When the study began, she tended to use material, especially images of particular anime characters, from other websites fairly indiscriminately and without attribution. In an early interview, she demonstrated to Kelly how she used a site called Transloader (http://www.transloader.com) as a tool to "raid" images from others' sites, rename them, and send them to her WebTV server. When Kelly asked whether this might be considered plagiarism, she shrugged, saying, "Everybody does it. It's a bad business out there" (Field notes, February 7, 2001). On another occasion, she talked about an image she used for the background of a "shrine" to two favorite anime characters: "I got it at a site. I didn't ask the person if I could use it" (Field notes, January 30, 2001). In each case, her body language and tone, as much as what she said, suggested that she perceived her actions as crossing a line of appropriateness, but the ease with which she could access the images and the unlikelihood that she would be caught seemed to override those concerns.

Six months after these conversations, Rhiannon's attitudes toward online Designing and source attribution began to change, presumably because of her increased exposure through membership

in her online community to other anime-focused sites where the conventions around integrating visual material from others were made more explicit. Several of her newer sites included credits for other contributors. For example, on a website she described as a clique (i.e., one that visitors could join and contribute to), she wrote,

> Please choose where you would like to go. Please, do not take any images, however. This layout was made for me by *Lunamoth Designs* off of her computer! She made all of the images you see here, and if you take any, that's plainly mean. Don't be cruel. Thanks. ^.~ Have fun!

This example also demonstrates, from an activity-theory perspective, how division of labor was handled within this online community. Those who were more skilled at the technical aspects of layouts would make them for other, less-experienced members of the community so that the latter would be able to construct more complex webpages than would have been possible without that assistance.

In addition to the credits for directly borrowed material, Rhiannon became more specific over the course of the study about the media texts serving as indirect sources for her Designing. For instance, she credited an anime-style video game for contributing to her romance-themed poem, "By a Crescent Moon": "[T]his poem was somewhat inspired by Squall and Rinoa from Final Fantasy 8, while also inspired by my own imagination. *cheesey smile* Enjoy!" Her comments are reminiscent of the New London Group's (1996) claim that "the outcome of Designing is a new meaning," one that is "neither a simple reproduction (as the myth of standards and transmission pedagogy would have us believe), nor is it simply creative (as the myths of individual originality and personal voice would have us believe)" (p. 76). Rhiannon's poem was neither purely derivative nor individually constructed; instead, it represented a blend of social and personal perspectives. Not only had her anime fandom offered her a source of Available Designs, but her experience with websites constructed by other members of the fan community had provided her with language she could use to discuss the influence of those sources. The practice of providing a brief introduction to such texts as poems or fanfictions was common across many fan-related websites.

As her self-described "cheesey" poem also suggested, traditional notions of heterosexual romance were among the dominant discourses influencing Rhiannon's Designing. Nearly all of her fanfictions had romantic themes, with one story culminating in a wedding for a female character she named after herself. Her bishonen gallery included two photographs of her boyfriend Scott and noted that she felt he looked like Squall, the male hero from the game Final Fantasy. Her introductory page for a website devoted to two male characters from the show *Gundam Wing* proclaimed that it was "non-gay," which, according to Rhiannon, meant that it did not provide pictures of "boys kissing boys" (Field notes, January 30, 2001). After being diagnosed with mononucleosis, she distanced herself further from homosexuality in a message saying that it would be impossible for Kelly to contract the sickness during an upcoming home visit. Rhiannon said, "you won't get it unless I spit on you or kiss you but I'm not a lesbo. So. And besides you're married anyway" (E-mail, May 23, 2001).

In each of these instances, Rhiannon used technology-mediated communication to strongly identify herself as heterosexual. While the anime shows she followed and fan websites she browsed certainly included some conventional ideas about gender and sexuality, several of them also included references to same-sex relationships and cross-dressing. In these cases, Rhiannon chose to take up some (but not others) of the discourses her anime fandom made available for her Designing. She combined this material with discourses and genres from other aspects of her life, including her membership in a conservative Christian church, to create online documents that helped to construct a particular identity as a heterosexual female, even as those documents expressed that identity to those who visited her websites. As other WebTV-using anime fans browsed Rhiannon's webpages, her references to these discourses of gender and sexuality became Available Designs for them to draw on as well.

Mentorship and pedagogy in a community of practice

School was not the place where Rhiannon received much assistance—either Situated Practice or Overt Instruction—related to her technology-mediated Designing. Her teachers were not aware of her knowledge of HTML or her writing of lengthy fanfictions, thus they did not draw on those interests and skills in their classes. From a Multiliteracies perspective, technology integration in her school placed far more emphasis on elements of linguistic Design than to visual, spatial, or audio modes. Rhiannon had to look elsewhere for mentorship and instruction related to webpage construction that integrated those sorts of elements. At first, she turned to traditional print resources, showing Donna a how-to

guide on Web design that she was consulting for advice on several projects, including a homework help site and a shrine to two characters from the anime show *Gundam Wing*. Not long after that conversation, however, Rhiannon left the book in Donna's room and did not retrieve it, deciding instead to seek help online.

Rhiannon learned a good deal about Web design through Situated Practice, more specifically, by reading the Web like a writer, to borrow a phrase from Smith (1988). She browsed the Internet for ideas for her own sites and traced links, if possible, to the original sources for features she liked. At the computer, for instance, she showed Kelly how she followed a link from a friend's site to http://www.beseen.com, where she learned how to insert a counter into her site to keep track of visitors. After using the same strategy to obtain code for a guestbook, she wrote the first entry herself under an assumed name. When Kelly asked why she had done this, Rhiannon explained the decision in terms of her experience with other sites: "If [people] don't see anyone else in there, they won't write anything.... People are just insecure with themselves, I guess" (Field notes, January 30, 2001). By incorporating features like counters and guestbooks from other sites into her own, she created concrete examples of what the New London Group (1996) called the ReDesigned: "a transformed meaning," created by the "play of cultural resources and uniquely positioned subjectivity" (p. 76). In each of these cases, her purpose for Web-based reading and writing—to create her own webpages to be viewed by other members of the anime-fan community—helped her to focus selectively on particular aspects of site construction and not others.

In addition to scouring the Web for design features she could use, Rhiannon sought out more formal, and more interactive, kinds of mentorship online. On occasion, she corresponded about design problems with a help site developer whom she described as a married, middle-aged man. She also sought out Overt Instruction in the form of an online course in frames (individual HTML documents that divide a browser window into sections) from http://www.draac.com, a center for HTML instruction, free e-mail, and free authoring tools that catered to WebTV users. Again, she credited Draac with a banner link and a note in the acknowledgments section of her HTML help site: "Thank You So Much For Helping Me With My Frames! I didn't know anything until I went to that course!" In contrast to her in-school persona, where she was perceived by her teachers as a somewhat passive learner, Rhiannon was a much more proactive agent in seeking assistance related to her webpage construction. She sought out others in the online community who could provide assistance for her in particular aspects of Designing that were more difficult for her—again, an example of how labor was divided among members of the community.

In addition to those members who were older than she, Rhiannon also received mentorship from other WebTV-using adolescents who were anime fans. She struck up friendships with two boys, Luke and Scott, who frequented the same Pokemon chat room she did. Using WebTV's instant message function, they sent her uniform resource locator (URL) addresses and sometimes even HTML code to help her build her websites. These online interactions increased the range of Available Designs on which she could draw during her digital composition, and she credited the boys for helping her in the Acknowledgments section of her HTML help page.

> Last but hello! Not least!! My two best helpers in the World!! Luke!!! Scott!!! Thank you guys so much for all your help and support! Without your help with HTML This site would [n]ot have been possible! At ALL!! **hugs u two** I love you both!!

In this way, Rhiannon expressed her gratitude for the Overt Instruction she received related to her tool use. The dedication also represented an online space for her to cement her relationships with both boys and position herself as the kind of girl who had relationships with male peers. Later, as the excerpt with which this piece began demonstrates, her Fanimania site proclaimed Scott as her boyfriend, despite the fact that he lived more than 2,000 miles away from her in New Mexico. For a girl who did not have a "local" boyfriend or many male friends in a school where such attachments were privileged, these references in both websites were important public statements, accessible to anyone in the WebTV community who happened upon her site, about her identity as a heterosexual female.

With the posting of Rhiannon's HTML Help Site for Kids! (and Adults Too!), Rhiannon began to position herself as a mentor for other webpage developers. Featuring anime-style graphics and examples, the site provided tutelage on fonts, backgrounds, tables, frames, songs, and layouts for novice users of HTML (see Figure 4 for a sample page). As such, it scaffolded visitors' potential integration of various Designs from the Multiliteracies framework, including linguistic, spatial, and audio modes, into their own website composition. Inviting visitors to contact

FIGURE 4
SAMPLE PAGE FROM RHIANNON'S HTML HELP SITE

her personally if they did not understand her written directions, she provided a link with her e-mail address. She also provided specific instructions for WebTV subscribers like herself.

> ***NOTE*** I totally forgot!! If you are a webtv user, you can use the color background on your signatures, but you CAN NOT use the image background! I don't know why!! But I've tried it many time[s] before, and it doesn't work! So be careful!! I don't know if it's the same for PC Users, but I know for webtv users, you can't do it! Sorry ☹

With communications like these, she began to serve in the expert role for others in her community of practice in ways similar to what her online mentors had done for her. She became the provider of Overt Instruction, not merely the recipient of it. This period marked a shift in her role within the online community as she moved from more peripheral roles (Lave & Wenger, 1991), such as developing sites with ample help from others, to a more central role of providing online assistance to others on their webpage construction.

Furthermore, by posting websites like her HTML help page, Rhiannon transformed the Internet, albeit in small ways, even as she was transformed by her use of the technology (Leu, 2000). By presenting a public image of a female possessing technology expertise, she believed she was making an incursion into what she saw as a "majorly male dominated field." In this way, she increased the Available Designs for others to construct identities as technological tool users. In addition, her ability to create webpages that drew on multiple modes of meaning in more sophisticated ways than her female peers, most of whom constructed text-driven pages with a few images as illustrations, set her apart, in her view, from other girls using technology, including her friend Eileen.

Eileen: Participating in the Artist's Circle mailing list

Eileen, a 12-year-old seventh grader when the study began, lived with her sister and parents (a lawyer and a social worker) in a single-family home in a middle-class neighborhood. Perceived by her teachers as an excellent student, she won several academic awards during our data collection period. She also participated in school-sponsored activities such as soccer and track, although she reported that she was sometimes isolated or even teased as a member of those groups. A talented and committed artist, she was invited as an eighth grader to take a special advanced art class, and her drawings were sometimes displayed in the guidance office of her middle school. Her technology-mediated literacy practices included e-mailing friends, most of whom did not attend her school; browsing websites related to her interests in anime and heavy metal music; and writing fanfictions that drew on material from her favorite anime shows. Much of her time on the family's home computer was spent participating in an anime art-focused mailing list, to which she regularly sent scanned copies of her artwork for feedback.

According to Eileen, her anime fandom was sparked by the Pokemon phenomenon in the United States. Although she quickly became disillusioned with what she perceived as Pokemon's poor visual and spatial Design qualities, her fascination with anime as an art form endured. Like Rhiannon, she used a traditional print text as an early resource in her inquiry, signing a book on Japanese comics out of the library. But she, too, quickly shifted to online resources when that book provided her with a URL address for the Anime Web Turnpike (http://www.anipike.com), a clearinghouse for links to industry

news, image galleries, plot synopses, fanfictions, and fan art.

One of the sites recommended by Anipike that most impressed Eileen was maintained by Zelda, a graphic artist in her mid-20s. Zelda's site included sign-up instructions for the Artist's Circle, an art-focused mailing list that she had founded and continued to moderate. The mailing list—or, as Eileen more often described it, the ML—allowed electronic messages with attachments to be sent simultaneously to all participants. Its monthly output ranged between 100 and 1,400 messages, with a mean of about 530. Postings were archived on the Web, where threads of past conversations (e.g., all responses made to one message with a new piece of art attached) could be followed. According to its homepage, the group welcomed both professional and amateur artists "who enjoy or create fantasy, science fiction, comic book, manga or anime artworks" and encouraged the posting of art in all media for members' critique. More than 150 people belonged to the group during the time of the study, although Eileen estimated that only about 50 contributed postings. According to Eileen, all members but one were female, a trend she attributed to males' lack of interest in fantasy-style art.

Eileen sent her first message to the mailing list in October of 2000, when she inquired if there were any other 12-year-old members who would like to correspond with her. Although she quickly discovered that most members were older than she (or at least they claimed to be), she continued to participate, posting her first response to someone else's piece of art a few weeks later. Unfortunately, her early participation in this activity system was limited, just as Rhiannon's webpage development had been, by her lack of certain technological tools—in this case, a scanner to facilitate sending her own drawings. Not until January 1, 2001, a few days after receiving a scanner as a Christmas present, was she able to send a message with her own art attached: "I finally got a scanner!!!! Here's a pen drawing I did @ a sleepover—not my best, but a start since I'm sorta clueless about my scanner *^_-* oh yeah, it's pretty big...." Over the next few weeks, she received messages from other members who complimented her on her work, encouraged her to send more of it, and explained the technical aspects of how to avoid sending attachments too "big" for others to handle. In these ways, they began to socialize her into the particular practices associated with tool use as part of membership in the list.

Technology-mediated Designing

Most of the texts privileged by the mailing list as an online community of practice depended on relationships among modes of meaning associated with the second and third conceptions of multimodality that New London Group members Kress (2000) and Luke (2000) discussed. Neither the written text (linguistic mode) nor the attached drawings (visual and spatial modes) of the postings could stand alone. When members sent their artwork to the list for critique, for example, they typically provided a frame for how their drawings would be "read" with the accompanying print text. On occasion, they integrated linguistic modes within the drawings themselves by providing labels or captions for characters or settings. Consequently, Eileen learned from more experienced contributors to the list how to use print to mediate her art.

In addition to being multimodal, Eileen's Designing for the mailing list was also self-consciously intertextual. Favorite anime series such as *Escaflowne* and *The Slayers* served as Available Designs for her, but she also drew on other media texts ranging from fantasy-related tarot cards and Beatles songs to the feature film *The Crow* (Proyas, 1994) and its sequels. On occasion, she even made reference to traditional print texts.

> Re: I've been reading kid[d]ie books...
>
> Attachment: malloninwonderland.jpeg
>
> yeah- I love alice in wonderland. And I can't unde[r]stand it. I was reading it again when I got the inspiration to do this lit[t]le number... O.O oh- and to the ppl who've read it, the poem is from the chapter "pig and pepper." (Mailing list posting, November 27, 2001)

The "little number" to which Eileen referred was a pencil drawing (see Figure 5) of an anime-style character dressed in a costume reminiscent of Alice's and holding a pig in a baby blanket. A poem from the text was handwritten next to the figure, as Eileen indicated in her message. By recasting material from the novel in an anime-influenced context, she appears to have been using her strength with visual modes of meaning to help her understand and respond to a linguistic text she found engaging but confusing.

In addition to its reworking of Carroll's novel, this posting is notable because the drawing is of Mallon, one of three characters Eileen created using knowledge of what activity theorists call the "conventions"—the implicit or explicit rules for participating in an activity system—of anime-fan art. Drawings of member-created characters were com-

FIGURE 5
EILEEN'S DRAWING *MALLON IN WONDERLAND*

mon on the list, and recipients would often ask if a character was "original" if the artist had not made that clear. When other artists sent drawings featuring Eileen's characters in their own styles (an ML practice that was also common), these drawings represented a new kind of hybridity, one demonstrating the recursive nature of the Designing process. Once they were posted via the ML technology, these ReDesigned texts became a source of Available Designs for the entire membership.

Another example of the way Eileen appropriated and transformed her sources comes from a message she wrote to Kelly about having sketched a Crow action figure she had seen in a catalog: "I anime-fied him and I'm having a pain in the @$$ time with his pose. He looks like a woman too. Maybe that's why I'm never going to get good at this....>.<" (E-mail, June 22, 2001). Rather than simply reproducing the action figure as she observed it in the catalog, she resituated it within the anime genre—an example of what the New London Group (1996) called Transformed Practice, or the use of new knowledge or skills in new contexts. In describing this process to Kelly in the e-mail, Eileen created a verbal term for it—*anime-fication*—that was just as hybrid as the visual and spatial process itself.

Eileen's comment to Kelly also reflects another pattern related to her Designing: her interest in gender and the physical representation of that gender in art. Among the Designs available for her drawings were conventionally gendered characters from anime series such as *The Slayers*, where the female characters were depicted as voluptuous because, according to Eileen, the producers wanted "to get attention from the boys' audience" (Field notes, March 13, 2001). The characters other members contributed to the mailing list were often similarly represented, although there were exceptions. At the same time, Eileen's own drawings were influenced by popular-culture images of actors such as Johnny Depp and Brandon Lee and rock stars such as Trent Reznor and Marilyn Manson, all of whom were androgynous in appearance and all of whom she admired.

During the time of the study, Eileen usually chose to dress androgynously herself, telling us that her friends thought she resembled Guns 'n' Roses frontman Axl Rose and showing us pictures of him that she had downloaded from the Internet. However, she knew that not everyone shared her taste. She wrote to Kelly that her father saw the objects of her fandom as "girly" (E-mail, June 26, 2001), and she shared reservations about sending drawings of male characters to the mailing list that looked "so...so...FEMININE!" (E-mail, June 27, 2001). Eventually, however, she sent nearly all of the pictures in question to the list, deciding to trust the other members to give her feedback regardless of whether they, too, preferred androgyny to more traditional representations of masculinity. Positive feedback from other members, especially those with the most experience as Designers in this context, also helped to allay her concerns about pushing conventions around gender representation too far.

Mentorship and pedagogy in a community of practice

As an activity system or community of practice, the mailing list served both informal and formal pedagogical functions for Eileen. One reason she decided to join the list in the first place was because she had been helped by online art tutorials posted by Zelda, the ML moderator. The tutorials featured drawings of anime characters that Zelda annotated with arrows and captions to highlight how particular features of the drawings created desirable and unde-

sirable effects. Eileen reported that these tips—a kind of Overt Instruction or explicit information-sharing (New London Group, 1996) facilitated by the Internet—helped her to improve her shading techniques (Field notes, February 27, 2001). They also created credibility for list membership as a way to apprentice herself to more skilled Designers in the anime style.

At the beginning of Eileen's membership, however, the mailing list provided more opportunities for Situated Practice than for Overt Instruction. For her first few months on the list, Eileen mostly *lurked* (a term ML members used to describe those who belonged to the group but did not post). However, she paid close attention to what others were doing as artists. "It helped me to look at other people's work. I got pointers that were nonverbal" (Field notes, February 27, 2001). In this way, the list allowed Eileen to engage in what Lave and Wenger (1991) called "legitimate peripheral participation"—the process by which less experienced members are socialized into particular communities of practice by taking on activities that are manageable for novices. Lurking and responding to other members' artwork without posting one's own were legitimate activities within the ML community, and both had pedagogical functions in terms of helping Eileen to become a more accomplished Designer of anime-related multimodal texts.

When Eileen got her scanner and began to post her own artwork, she moved toward what Lave and Wenger (1991) called "full participation" in the list, or participation where the community member takes on a larger share of the tasks associated with membership. Only when she obtained a particular tool typically used by members of this activity system could she begin to receive direct feedback from established members. This feedback became more useful to her in improving the quality of her artwork when Zelda changed the guidelines for mailing list participation a little more than a year after Eileen signed up. Citing concerns that the list had veered from its primary mission of providing response to artwork (a sentiment that several established members echoed), Zelda posted a message with the subject line "Time for an overhaul/Everyone please read," which urged members to make honest, constructive feedback the center of their postings. In this way, she encouraged members to provide more Overt Instruction, or explicit assistance meant to help individuals gain "conscious awareness and control" over aspects of their Designing (Cope & Kalantzis, 2000, p. 33). This Overt Instruction, in turn, would help promote members' ability to engage in Critical Framing, or the ability to "stand back" from what they were doing and view it "critically in relation to its context" (Cope & Kalantzis, 2000, p. 35). In a message to the list, Zelda explained her reasons for the list's new focus:

> Think of this as an online Art University and that may help. What would a teaching assistant tell a younger artist to help improve that drawing? Try to reply to people's artwork as a teacher would, not as a friend would. Friends are great for ego boosts but most don't critique your work when you show it. Instead, like I stated above, they usually say "That's cool" and leave it at that. That's rarely helpful. (Mailing list posting, November 21, 2001)

A few days later, Zelda invoked discourses reminiscent of formal schooling again in a message directing members to address at least three of seven topics (e.g., composition, perspectives, anatomy) in their responses to other members' work. Under each of the topics, she provided a few questions to illustrate what she meant, though she also invited talk about other topics she had not listed, saying "There are certainly more art topics than these seven." Acknowledging that some members might find it difficult, given their online friendships, to be critical of one another's work, she closed her message with a positive exhortation: "These new rules are to enrich the list and make it worthwhile. I hope everyone will be able to learn from each other this way. Let us all flex our critiquing muscles!" (Mailing list posting, November 30, 2001).

With Zelda's guidelines fresh in their minds, ML members provided Eileen the most detailed feedback on a drawing that she had received up to that point. The following response is from Buffy, one of the list's most frequent and experienced contributors.

> The background is kinda simple, which is actually a pretty good idea. You might want to add something towards the bottom of the picture to balance all the items you have floating around at the top.... Also, his chest is either really small, or really smushed. Either way, it's not a good look with large biceps (those are the ones on the top of the arms, right? I get confused sometimes). Not to be crude, but he needs more shading in the crotch area. It seems there's nothing there from knee to knee. Otherwise, I love the expression, especially the grin. It totally sets the mood to scare some people. Or freak them out, whatever. And like usual, nice shiney hair. Very pretty. (Mailing list posting, December 7, 2001)

As was often the case on the mailing list, Eileen and Buffy wrote back and forth about these comments, with Eileen acknowledging the drawing's limitations and asking for tips—which Buffy provided—about how to deal with the shading issue. Eileen's participation in dialogue like this, mediated by the

mailing list, coincided with an appreciable improvement in the quality of her artwork, particularly her use of space and attention to anatomy. While these changes cannot be attributed solely to her membership in the newly revamped mailing list (she was also enrolled in an art course and pursued a relationship with a noted line-drawing artist through the Internet), it is clear that the more incisive feedback she received played a role in her increased sense of agency and greater ability to engage in Critical Framing related to her own work. She was better able to identify the aspects of her drawings that needed more attention (e.g., "yes, I know the blood looks like crap") while devising approaches to solve those problems given the purpose and audience for her work. Although she did not consider the political and ideological dimensions of her Designing that the New London Group (1996) privileges, the conversations with other members did help her to reflect on her work within the ML as a "cultural context" (Cope & Kalantzis, 2000, p. 34) where certain kinds of Designing were valued more—and fit better—than others.

Eileen's participation in the refocused mailing list also scaffolded her ability to provide "CNC"—the list's shorthand for "comments and critique"—to other artists. Just as Rhiannon was able to serve as an online mentor to others once she posted her HTML help website, Eileen provided Overt Instruction and Critical Framing to others on the mailing list with her feedback on their postings. A good example of this comes from her response to another member's call for critique on a drawing in a new genre—realism.

> Hmmm. I really am not very good at realism, but here goes nothing...first off, the eyes are a tad too far apart. Umm...the shading is really nice—it sets off the face. The hair looks good too, but I'd clean up the smudge lines a bit, and make the lines on the tiger darker. Overall, I think it looks a - - - - of a lot better than any of my horrid realism attempts O.o that's about all I can say, being young and inexperienced and drawing guys with two left hands...>.< hope I wasn't too brutal! (Mailing list posting, December 3, 2001)

Blending critique with compliments, Eileen used emoticons and a little self-deprecating humor to soften the criticism even further. With her reference to "drawing guys with two left hands," she hearkened back to an ML thread in which several members had critiqued her representation of a character's hands—a rhetorical move that subtly reminded the recipient that Eileen herself had recently been in the position of receiving feedback. In a similar manner, she began her commentary on another drawing by pointing out strengths: "she's so cute! Her dress is especially pretty. The only thing is her forearms—they are a little too thin" (Mailing list posting, March 26, 2002). She sent along a sketch to supplement the text of her message and make her suggestions more clear: "I attached an example of how they should look more like. I'm not perfect, but I hope I can help. ^-^." Her responses in both cases suggest that the ML community of practice helped Eileen learn to critique others' submissions using a combination of visual, linguistic, and spatial modes.

The responses also suggest that she was drawing on various discourses related to gender to guide her participation. Her strategies for softening her criticism in order to preserve her online relationships resembled those used by women belonging to two mixed-sex mailing lists researched by Herring, Johnson, and DiBenedetto (1995). In contrast to the males in that study, who often silenced others with confrontational or authoritative postings, female participants on this mailing list used polite behavior and engaged in consensus-building. At the same time, Zelda's refocusing of the list around critique required Eileen to provide direct criticism of the deficiencies of other members' work—a stance not usually associated with traditional discourses of femininity but one that Eileen did take up and one that the revamped mailing list promoted as an activity system. Once Zelda made it clear through Overt Instruction that full participation in the list required such directness, the conventions of the list shifted a bit. Eileen's technology-mediated Designing therefore took place in the context of an online community that was influenced by competing discourses about what it meant to be female, as was also the case for adolescent girls constructing homepages on gURL.com (Duncan & Leander, 2000). Where the ML was concerned, some of these discourses probably came from members' experience in formal educational communities as Zelda's comment about the list as an "online Art University" demonstrated, while some came from representations of gendered relationships in the anime texts with which members transacted. Other sources less obvious to Eileen or to us, as outsiders looking in on the mailing-list community, were undoubtedly important as well.

Although we make this claim tentatively on the basis of somewhat limited data, it seems possible, perhaps even likely, to us that the mailing list was a supportive space for Eileen to explore some of these complexities related to gender because hybridity and contradiction characterized many of the texts valued in that community. Because a good deal of the art she critiqued and the media forms she borrowed for her own art played with conventions of gender rep-

resentation, Eileen had access to a variety of discourses beyond traditional, dominant ones about femininity and masculinity. Her comments to us on several occasions about anime producers needing to promote certain kinds of representations to attract particular audiences suggest a nascent Critical Framing about the industry to which her community of practice responded in their postings and artwork. Her attempts to make drawings that were feminine but not "too" feminine suggest that she was exploring the edges of constructions of femininity and masculinity available to her, as well as the places where those constructions intersected with and made reference to one another. The multimodality of the texts she constructed and the multimedia capabilities of the technological tools she used allowed her to explore these issues using visual, spatial, and linguistic Designs of meaning, rather than from the vantage point offered by only one mode.

Discussion

Rhiannon and Eileen's cases illustrate that adolescent girls employ technological tools in a variety of ways and for a variety of purposes. In contrast to the AAUW's (2000) *Tech-Savvy* study, which focused primarily on in-school data, we were able to consider data on girls' technology-mediated literacy practices in several different contexts, including home and online. This allowed us access to practices that were not privileged in classes yet were highly valued beyond school. Rhiannon's creation of an HTML help website complicates traditional gender stereotypes such as the assertion that "girls tend to equate understanding the inner workings of the computer with boys' tendency to be interested in technology for its own sake, something that does not, in the main, capture girls' interest" (AAUW, 2000, p. 9). Rhiannon's interest in learning to program and Eileen's interest in learning to negotiate the attachments and links related to the mailing list show a willingness to go beyond basic word-processing skills in order to obtain skills and knowledge that were personally relevant. This trend reminds us of key tenets of expressivist literacy pedagogy that position purpose, audience, and time as essential elements to joining the "literacy club" (Smith, 1988). At the same time, analysis of the mentorship and instruction each girl received within her respective online community of practice reminds us, as expressivist theorists do not, of the crucial roles of Overt Instruction and Critical Framing in learners' quests to obtain full membership in the "New Times" version of that club.

The girls clearly had multiple purposes or objects for Designing in their respective activity systems. Eileen participated in the mailing list because it allowed her to obtain feedback on her work from other artists who would have been difficult to contact, much less correspond with regularly, without the Internet. She also used it to construct joint narratives about characters with other fans—another pursuit facilitated by the easy sharing of digital files. Rhiannon constructed webpages within the WebTV anime-fan community because she wanted to express her fandom for particular shows and characters and because she wanted to improve her skills as an online designer in order to pursue a career in that field in the future. For her, learning to manipulate the technology was a means to an end as well as an end in itself.

It appears that both girls used their membership in online communities to create richer and more satisfying social lives than they had in real time. Our in-school observations revealed that their social circles were limited, and each reported being teased at school by other adolescents. Within their online communities of practice, however, both found certain kinds of acceptance and friendship. For example, her use of WebTV helped Rhiannon discover others who shared her interests in anime, fanfiction, and webpage construction. Rather than marginalizing her as a "geek," her technology expertise gave her status within the community. In addition, WebTV connected her with Scott, the online boyfriend and fellow anime fan featured in her Web-based bishonen gallery. Their relationship helped to position her as a heterosexual female to those who viewed her webpage, an aspect of her identity that appeared to be very important to her. In a similar manner, Eileen's use of technology helped connect her with others who supported her continuing artistic development and appreciated the quirky set of popular culture sources on which she drew. In stark contrast to her experiences in school, where her interests often set her apart from mainstream peer cultures, pursuit of these common interests created bonds between her and other members of the mailing list.

In pointing out the ways in which their membership in online communities benefited both girls, we do not mean to suggest that these virtual relationships should be seen as substitutes for face-to-face relationships with others. Both girls lived large chunks of their lives in real time, not online, and the contrast between the way they were treated on the Internet and the way they were sometimes treated at school was certainly obvious to them. We have little direct evidence to suggest that those online relationships made it any easier for them to negotiate their

daily lives beyond the Web. At the same time, we do not see Eileen and Rhiannon's investment in their online relationships as potentially detracting from or damaging to their ability to negotiate relationships face to face, as some critics of the Internet have suggested. Instead, WebTV and the mailing list provided alternative venues in which both girls developed a greater sense of their own agency, both as Designers and as users of technological tools, and could pursue relationships that were satisfying to them.

In addition to offering companionship and social support, the girls' membership in their online communities served mentorship and pedagogical functions related to their technology-mediated Designing. In contrast to the experience of adolescent informants in studies by Knobel (1999), Sefton-Green and Buckingham (1998), and Tobin (1998), neither girl received much mentorship or assistance from family members regarding her use of technology. Our home visits and phone conversations with the families suggest that both girls knew more about computers than their parents did. This is not to say, however, that they rejected adult intervention or advice. In addition to responding to Eileen's artwork, a number of older and more experienced ML members helped her learn to use the mailing-list technology more effectively and efficiently, explaining how to use a scanner, how to save images in multiple formats, and even how to use computer graphics programs to obtain different effects in a piece of art. Rhiannon received direct instruction about HTML from a number of online mentors, some of whom were age peers and some of whom were much older than she. These relationships scaffolded both girls' tool use and helped them move toward full participation in both communities of practice to which they belonged. Without the assistance they received from other, more experienced members, their development as technology users and multimodal composers would certainly have lagged. It is possible that they might have abandoned their respective technology-mediated activities altogether.

Gender was implicated in the girls' technology-mediated Designing as members of two different communities of practice. At the most obvious level, their preferred activity systems were primarily single sex—a trend that both girls pointed out to us on numerous occasions and seemed to see as important to our understanding of their technology-mediated activity. Eileen's mailing list attracted self-identified female members almost exclusively. When she spoke of Akita, the one male member who consistently posted to the list during an early period of the study, she nearly always referred to him as "Akita, our one guy." Rhiannon repeatedly talked about her views of webpage and computer-game designing as male-dominated fields—a perception that was reinforced by her WebTV community of anime fans, where she encountered far more males than females. Both informants' awareness of these gender imbalances seemed important to how they experienced participation in these communities.

In addition, both webpage construction and mailing-list participation provided the girls with a space to explore and express their gender identities. Each used Available Designs from popular culture to consider the complexities of heterosexuality, develop standards of physical beauty, and explore the relationships between masculinity and femininity. The technological tools available to them as participants in these particular activity systems allowed them to share their perspectives on gender with a wider audience than would otherwise have been available. Because of their contrasting stances toward understanding the inner workings of the technologies they used, Eileen and Rhiannon also helped to move us beyond the broad trends that studies such as *Tech Savvy* (AAUW, 2000) traditionally associated with girls' technology-mediated reading and writing. They also challenged us to consider the in-group variation (Orellana, 1995) that exists in how early adolescent girls view and use technology within particular communities of practice.

In addition to gender, social-class status appeared to be significant, especially for Rhiannon, to the girls' technology-mediated literacy practices. That Rhiannon accessed the Internet through WebTV rather than a more expensive personal computer meant that she was marginalized from social activities, such as America Online's instant messenger service, that were central to the peer culture in her school, even as WebTV opened up a new and different online community to her. She did not have access to software such as Pagemaker or Adobe Photoshop that other girls in our study reported using at home to make academic assignments more attractive or better organized. At the same time, the fact that she had Internet access at all meant that she could seek information and assistance that might not have been available to a family with such means only a short time ago. Access to the Internet meant that she did not have to pursue her interest in anime through more costly routes such as comics, videos, and books. Nor did she need to resort to expensive activities such as computer camp or after-school tutoring to learn more about Web construction; instead, she participated in free tutorials and sought advice from online friends and acquaintances whose greater experience

and knowledge base meant they could scaffold her performance. Eileen's middle-class family was better able to afford equipment to support online activity (e.g., a computer as opposed to WebTV, a scanner, a digital camera) than Rhiannon's working-class family. At the same time, her parents chose, as a cost-saving device, a free Internet service provider that imposed some key limitations on Eileen's Internet use, including her ability to view links within her e-mail program. Neither girl was able to use the Internet while talking on the telephone, download large media files quickly, or spend unlimited amounts of time online—all activities taken for granted by peers whose families had high-speed Internet access. These issues suggest that the large percentage of students in Donna's classes reporting access to a home computer (nearly 95%) may mask some significant differences in how those computers are integrated into particular students' literacy practices. Even when students have access to the same kinds of technologies, we are reminded by the girls' cases as well as by our theoretical frameworks of the need to consider how those tools are specifically used as part of membership in particular communities of practice.

Implications

Analysis of these two cases suggests a number of implications for classroom teachers interested in supporting adolescents' literacy development and for researchers interested in investigating aspects of that development. Because the present study benefited a great deal from Donna's "insider" perspective on the girls' experiences and the research context, we want to say explicitly that these two categories of people need not be seen separately; they may indeed overlap in the person of a teacher researcher.

Implications for practice

Like earlier research on students' use of multimedia technological tools (e.g., Beach & Myers, 2001; O'Brien, 2001; Wilhelm et al., 1998), this study suggests what might be possible if literacy teachers created opportunities for students to engage in multimedia composition, particularly when those compositions are related to areas of interest for the students. The girls' experiences suggest that such classroom activities may be motivating to adolescent students. Rhiannon's products were not always sophisticated; in fact, she often failed to finish them, as did the informants in Sefton-Green and Buckingham's (1998) study of young people's "creative" technology use. Nonetheless, she demonstrated a good deal of tenacity and engagement related to her online composing, if not to all of her compositions. Eileen devoted similar time and energy to her postings to the Artist's Circle, developing some important insights through her participation about integrating various modes of meaning and using such technological tools as scanners, digital cameras, and listserv software in the process. While this engagement in technology-mediated composing may be attributed in part to the girls' commitment to personal interests such as anime that are not—and perhaps should not be—easily imported into schools, there is also evidence to suggest that both girls were motivated by various aspects of the digital tools themselves. Classrooms that embed such tool use within social learning communities may be able to put students' increased motivation to work to serve interests more closely aligned with school curricula.

It is possible that such technology infusion may also change those school curricula. In some important ways, the girls' Web-based communication may be better suited to the changing literacy demands of many workplaces than traditional texts like the five-paragraph essay (Cope & Kalantzis, 2000). The online texts the girls created beyond formal academic settings certainly looked more like the multimodal, multimedia texts discussed by Luke (2000) and other Multiliteracies contributors than the school-based artifacts they shared with us. The chance to construct such texts in a classroom setting, where their teachers and, most especially, other tech-savvy peers could provide feedback and suggest new ways of Designing, could help the girls to make their texts that much more complex. Such activities might also have the potential to shift classroom culture toward a more learner-centered paradigm, though the work of Myers et al. (2000) reminds us that such a shift will not automatically take place just because new tools have been introduced.

Use of multimedia, multimodal technologies in the classroom also has the potential to position students to support one another's Designing. Much of what both girls knew about multimodal Designing using technology came from their membership in online communities of practice. Over time, as more experienced members mentored them in the use of these tools, Rhiannon and Eileen learned to provide mentorship and assistance to others in those communities, and they began to take positions as both mentors and the mentored. We believe that they might, under the right conditions, have been able to provide mentorship and assistance related to technology-mediated Designing to others in differ-

ent contexts, including in school. Both girls' considerable experience with digital tools and the integration of multiple modes of meaning in their Designing might have allowed them to serve as models and resources for other students had their teachers embraced some key aspects of the Multiliteracies framework. For these reasons, we urge teachers to learn more about their students' technology-mediated literacy practices beyond the classroom in the hopes of identifying opportunities for students to serve as mentors for others as well as times when they can benefit from peer mentorship. In this way, classrooms may become communities of practice where digital tools are used to pursue common objects such as the development of academic literacy and the construction of new identities.

Recruiting students like these girls for peer mentorship roles will not be simple, however, and should not be undertaken by teachers without a good deal of thoughtfulness. Both girls realized the power of participation in certain activity systems to position them with others. Rhiannon was especially careful to present her technological expertise in different ways with different people. She took pains to share her knowledge and discuss her interests, particularly her anime fandom, in what she viewed as safe contexts. Teachers who hope to encourage students like her to mentor others in their transactions with digital technologies will need to negotiate those interactions carefully and sensitively, because they involve significant risks for both student mentors and the mentored. Without attention to these potential risks, including those associated with particular gendered constructions of technology use, the significant benefits that might be realized from drawing on students' out-of-school transactions with technology may be subsumed by the social cost of public revelations for individual learners.

In addition to recruitment of tech-savvy students for peer mentorship, the study suggests a number of roles that literacy teachers might play in helping adolescents learn to engage in multimodal Designing, often with the aid of multimedia technological tools. By brokering students' use of Web-based resources such as chat rooms, mailing lists, and sites like http://www.draac.com, teachers may be able to link individual students with communities of practice possessing expertise related to their interests as well as to various aspects of the Design process. To do this, teachers need not possess highly sophisticated technology skills themselves; instead, they must be familiar with various online resources as well as with students' needs and interests in order to connect individual adolescents with others who can support and challenge them as they compose and construct meaning with technological tools.

Furthermore, there are plenty of ways that teachers might assist students with technology-mediated Designing that do not depend solely on teachers' firsthand use of the tools. Our own experience as researchers provides a case in point. Although the girls did not acknowledge either of us as technology experts (Rhiannon went so far as to characterize Kelly as "clueless" about HTML programming), both welcomed feedback and critique from the two of us on their technology-mediated compositions. (Eventually, we came to believe that their desire for our response was a significant factor, especially with Eileen, in their tolerance of our extended data collection and numerous requests for clarification.) As adults with considerable experience transacting with various kinds of texts, digital and otherwise, we had enough knowledge to talk with Rhiannon about ways to credit others for the images she borrowed for her websites. We had enough knowledge to engage Eileen in conversations meant to frame critically how women were represented, both through linguistic and visual modes of meaning, in the anime videos she drew and wrote about on the mailing list. While our role as researchers, not English teachers, sometimes kept us from following up on all of the opportunities for scaffolding new learning that our time with the girls presented, we could easily see multiple occasions when we might have done so had we been responsible for their English or reading classes.

In making these recommendations, we do not underestimate the challenges teachers face in integrating attention to digital literacies in classroom instruction. Teachers may find it threatening to have less personal experience with these digital tools than some of their students do. Lewis and Finders (2002) learned that many new teachers, even those for whom the use of digital technologies was personally comfortable, found it difficult to assimilate classroom use of these tools into their conception of their roles as teachers. Fortunately, some models of inquiry are beginning to be articulated that can help teachers of adolescents to reconceptualize their roles related to digital technologies through social interaction with other professionals. A promising step in this direction is represented by Hinchman and Lalik's (2002) recent work on "scenariating," a structured planning process that allowed a group of literacy teachers to consider how literacy teacher educators might prepare teachers who will be "able to make new literacies and digital technologies more significant in secondary school classrooms" (p. 87). As participants explored "critical uncertainties" (p.

88) related to this question, they were able to flesh out a list of recommendations for professional development that would acknowledge the different starting points for teachers with different experiences with and attitudes toward new literacies and digital technologies. This list—and more important, the process of scenariating itself—has the potential to help teachers and administrators make context-specific action plans for developing teachers' ability to accommodate skills related to Design and technological tool use that students have gained in their out-of-school literacy practices while simultaneously helping students to refine and reflect on those skills.

Implications for research

The study also suggests some possibilities for further research. While it offers an intimate, contextualized look at particular adolescents' use of technological tools in their literacy practices, this project, like nearly all of the research on young people's use of technological tools we reviewed, was conducted on a small scale. It would be dangerous to generalize too far from the patterns and themes we offer, as Rhiannon and Eileen's cases may not reflect the experiences and perspectives of teenagers with different backgrounds and interests. This is especially important given both girls' status as English-speaking European American teenagers. While we can speculate that their technology-mediated literacy practices reflect their affiliations with these discourse communities, we do so on the basis of limited data, without much reference to the experiences and perspectives of teenagers who do not share this profile. For these reasons, we suggest that larger scale research on adolescents' technology-mediated literacy practices is needed, particularly with groups of informants who vary in terms of race, ethnicity, and language status. Rather than a survey- or focus-group-dominated project such as those completed by the AAUW (2000) or the Pew Internet Project (Lenhart, Rainie, & Lewis, 2001), we believe a multicase design mixing qualitative and quantitative methods and carried out over a considerable period of time would yield the most useful results. The study by Giacquinta et al. (1993) of 80 families' home computing might serve as a useful model, as their sample size allowed for diversity on a number of variables, but their assignment of one research assistant per family allowed them to develop relationships central to rich data collection over time. Their model could be enhanced by including school-based data collection, allowing young people's technology-mediated literacy practices to be traced and compared across multiple contexts. Such initiatives would be time- and labor-intensive, but they might yield insights available in no other way.

Such initiatives would also be enhanced by continued use of Multiliteracies (Cope & Kalantzis, 2000; New London Group, 1996) as a theoretical lens. Although we chose to use the framework as an analytical tool partway through data collection, we did not design the study to inquire about the four pedagogical components deliberately. Had we done so, we might have been able to take up in more depth such questions as the following: (a) Which components seemed to have more weight related to our informants' learning about digital tool use? and (b) How were the components enacted differently in different online contexts? While we see value in our descriptive data about how elements of the pedagogical framework played out in the two activity settings discussed here, it would be helpful for both researchers and teachers to be able to consider more explicitly the relationships between and among those components. To that end, we think it could be useful to explain the New London Group's (1996) conceptions of Situated Practice, Overt Instruction, Critical Framing, and Transformed Practice to adolescents in "kid-friendly" terms before inviting them to talk from their own perspectives about opportunities for and influences of each component related to their digital tool use in particular communities of practice. Such conversations might lead to insights difficult to develop through participant observation alone.

Another potential line of inquiry building on this study might focus on mentoring. Just as Cole's (1996) work in the Fifth Dimension did, the study suggests that young people sometimes move back and forth between the role of mentor and the role of the mentored within online communities of practice. We did not observe this fluidity in Rhiannon's and Eileen's cases until after they had been members of the community for a considerable period of time, but it did seem to be an important theme of their tool use in these activity settings after they established themselves with other members. Further research could trace how students take various positions related to mentoring in online communities as well as in classroom settings where students are invited to use digital tools in their Designing. The latter seems especially important given the diversity of technology experience and expertise likely to be found among students in a typical secondary classroom, as well as the possibility that some students will be more tech-savvy than their teachers. Further work in this area could build on Donna's finding

from another study (Mahar, 2003) that some tech-savvy students resist teachers' abdication of the mentor role related to digital tools, seeing it as a violation of the codes and conventions of the classroom as an activity setting.

Finally, we believe that it would be fruitful to study the technology-mediated literacy practices boys engage in outside of school. We began the study believing that girls' use of technology had been understudied with the use of sociocultural frameworks, particularly where literacy was concerned. While we still believe this to be true, we wonder whether it might have been even more profitable to consider technology-mediated literacy practices and constructions of masculinity and femininity simultaneously, with a mixed-sex rather than single-sex group of informants. Aside from studies of boys' computer gaming (e.g., Alloway & Gilbert, 1998), little work has been done by literacy researchers that deals with the intersections of masculinity and technological tool use. Nuanced, complex research on such topics may not only provide new insights about how to meet boys' needs better in the literacy classroom but also cause us to reevaluate what we believe about girls' use of technology in their literacy practices.

However these future studies are focused, we believe there is more work to be done in the space where literacy, technology, and identity intersect for adolescents. Those who gather and learn from data about students' technology-mediated literacy practices may find themselves initiating, in the words of Multiliteracies contributors Cope and Kalantzis (2000), "a transformation that does not leave [students'] selves behind in the fashion of assimilation, but which recognizes and builds upon those selves, in their diversity and in the multilayered nature of each person's identity" (p. 147).

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