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Science After School: Putting Everyday Literacies to Work in the Service of Classroom Learning

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As I write, the newspapers in Georgia—along with the local 6 p.m. and late evening news anchors—are reporting what State School Superintendent Linda Schrenko terms an "abysmal" situation. Earlier today (August 27, 2002), Schrenko announced that the average SAT score of graduating seniors in the state of Georgia stands at 980, which places the state dead last in the national rankings. Only the District of Columbia is behind with a score of 951. According to Superintendent Schrenko, a right-wing Republican who has guided the state education system for the past several years, "Where we started is abysmal, where we ended is abysmal. I'm fearful we are now on the wrong track." (Downloaded from http://www.11alive.com August 27, 2002)

We're on the wrong track—somewhat of an understatement (and certainly of limited interest, I expect, to the majority of the people who will read this paper thousands of miles from Georgia). Yet Schrenko's remark is noteworthy if for no other reason than it captures what many of us who have studied the so-called struggling reader have suspected for some time now: a one-size-fits-all model of schooling, no matter how well researched, is largely irrelevant for far too many underachieving, less privileged youth at the secondary level (Alvermann, Boyd, et al., 2002; RAND Reading Study Group, 2002). Although this is not a new idea—Eckert (1989) observed more than a decade ago that traditional schooling separates itself from the real world adolescents occupy and find compelling—it remains the modus operandi in most schools today:

> Schools typically operate on 'corporate models' that divide young people, atomize their roles, and encourage them to move ahead in a lateral, hierarchical fashion. A strict split between in-school and out-of-school relationships is fostered. Less privileged youth, however, operate on a very different model—a more collaborative and supportive model that encourages heterogeneous relationships that coexist between and across institutions. [This calls] for an education that is based on real world activities that can draw on all the resources such young people bring to the table—resources often occluded in school life. (Dimitriadis, 2001, p. 372).

The irrelevancy issue carries a message that some policy makers, parents, educators, and high achieving students do not like to hear, and we do our best to rationalize its impact. For example, the student newspaper at the University of Georgia, where I teach, responded to Schrenko's statement with this headline: "High number of tests taken causes Georgia to fall in SAT rankings" (*Red & Black,* August 29, 2002). This is in reference to the fact that while 65% of Georgia's high school seniors took the college entrance exam, fewer than 10% of the graduating students in 13 other states took

it. The *Red & Black* was also quick to point out that while the average SAT score in the U.S. is 1020, this year's average entering freshman at the University of Georgia posted a score of 1215. But no matter what the spin, the situation is serious, especially for those who are not making the grade largely due to their struggles with reading.

There is a message here for science and literacy educators, and it's one that I want to use in framing this paper—namely, we know *something* needs to be done to help underachieving, struggling readers but we're not sure just what, and further, we have little data on which to base our understanding of *how* these readers approach learning in other than formal school contexts (Hull & Schultz, 2001). Why this is the case I'm not sure. Perhaps as researchers we feel more at home studying the pedagogies of scientific literacy in the classroom rather than in other less formal learning environments. Maybe it's a sense of having easier access to and more control over what we study when we observe in familiar and safe places. Yet I would contend that it's in out-of-school contexts—e.g., after-school clubs, community organizations, workplaces, public libraries with free Internet access, and mall video arcades—where we're more likely to observe young people using their everyday literacies in ways that foster informal, but powerful and complex, learning. Ways, in fact, that could inform science teaching and learning in schools.

To support this contention, I draw from data gathered in an after-school media club for struggling readers that several graduate students and I studied under a grant from the Spencer Foundation (Alvermann, Hagood, et al., 2002). I also draw from the theoretical underpinnings of Gee's (in press) work on what video games have to teach us about learning and literacy, and from the cultural modeling project that Lee (1997, 2001) developed for use with underachieving high school students. For support in treating literacy as a constitutive practice of science learning, I am indebted to Norris and Phillips (2001) and to Osborne (2002). This paper is divided into three sections. The first section deals with readers struggling to comprehend their school science texts; the second, with using students' language and cultural practices to scaffold science learning; and the third, with analyzing how Ned, a struggling reader in the media club project, approached learning in an informal out-of-school context—one in which his self-initiated questions and problem solving capacities led to new learning. The processes he engaged in (more so than the content he learned) would seem to have something to say to both science and literacy educators.

Troubling the "Struggling Reader" Label

The term *struggling reader* is a contested one. A cursory analysis of the reading research literature reveals that struggling is used to refer to youth with clinically diagnosed reading disabilities as well as to those who are English language learners, second-language readers, "at-risk," low-achieving, unmotivated, disenchanted, or generally unsuccessful in school-related reading. Adolescents who can read but choose not to do so—the *aliterates* as they are sometimes labeled (meaning they have the

capacity to read but elect not to)—are written about less, but their situation is no less worrisome. A smorgasbord of descriptors, these labels tell little or nothing about the possible sociocultural construction of such readers.

According to education anthropologists McDermott and Varenne (1995), it is society at large that produces the conditions necessary for some individuals to succeed, others to struggle, and still others to fail outright. This notion finds support in the writings of a cross-disciplinary group of scholars (Gee, 1998; Hinchman & Moje, 1998; Knobel, 1999; Lankshear, Gee, Knobel, & Searle, 1997; Luke & Freebody, 1997; New London Group, 1996) who make the point that literacy is much less about skill development than it is about access to certain social, economic, and cultural resources. Thus, for example, the cultural construction of a struggling reader is all inclusive. It "includes everyone involved in constructing `School'…school personnel, of course, and parents, and let us not forget the philosophers, curriculum designers, textbook publishers, testers, and educational researchers…in other words, "Us" (McDermott & Varenne, 1995, p. 331).

Applied to school learning, one could interpret all this to mean that traditional schooling may be making struggling readers out of some youth, especially the ones who have turned their backs on a version of reading and writing commonly referred to as academic or school literacy. Why might this be the case? I have argued elsewhere (Alvermann, 2001) that in their effort to raise the bar by implementing high standards—a noteworthy goal in most people's minds—schools are promoting certain normative ways of reading texts that are disabling some of the very students they are trying to help. This is problematic, especially given that many such normative ways of reading are losing their usefulness (and validity) in the wake of new technologies and changing literacies (Lankshear et al., 1997).

Adolescents with a history of reading difficulties present particular challenges to content area teachers, and particularly science teachers. Because they read so infrequently, these youth typically will not have acquired the requisite background knowledge and specialized vocabulary needed for comprehending most school science texts. Teachers understandably become frustrated when this occurs and sometimes resort to what Finn (1999) calls a "domesticating" education. That is, they expect less of these students in exchange for the students' good will and reasonable effort in completing content area assignments that typically require little, if any, reading. For example, in the following excerpt from a seventh-grade general science class, Ms. Winter (all names are pseudonyms) substituted fill-in-the-blank worksheets and board work for the more difficult state-adopted science texts, which were stored in neat, virtually untouched stacks against the back wall of her classroom:

> **Ms. Winter:** [*explaining what a kilo means*] 1000 times larger. So if it's a kilogram it's 1000 times larger than a gram. So one kilogram equals what? [*Pauses for a second*] A thousand grams. OK, let's keep going. One meter

> equals how many millimeters? [*She looks around the room.*] Besides Eddie—he knows it all. OK, Eva Lynn?
>
> **Eva Lynn:** 1000.
>
> **Ms. Winter:** 1000. Keith, what does *milli* mean?
>
> **Keith:** 1000 times smaller.
>
> **Ms. Winter:** 1000 times smaller. 1000 times smaller is what *milli* means, so if we have a millimeter we have something that is 1000 times smaller than a meter. And it takes a thousand millimeters to equal one meter. (Alvermann, O'Brien, & Dillon, 1990, p. 308)

The students who were enrolled in this general science class were part of the school's basic track; they struggled with reading assignments in each of their subject matter classes. Most were African American youth from a rural community in the Deep South, and over half had been retained at least one grade level prior to arriving in middle school. They were generally compliant and caused few disturbances in class despite a curriculum that emphasized rote learning, recitation, and few connections to students' lives outside of school.

Using Students' Language and Cultural Practices to Scaffold Science Learning

It's been said that "speech makes us human and literacy makes us civilized (Olson, 1988, p. 175). In making this observation, Olson was referring to written language and the bias it imparts both to the way we think about knowledge—how we organize it, store it for reuse—and the cognitive consequences of schooling and literacy; in short, a bias favoring the written text over the oral tradition. This bias, however, is far less clear when viewed within Carol Lee's (1997; 2001) use of *signifying*, a form of talk widely practiced within the African American Vernacular English (AAVE) speech community, to scaffold underachieving students' literary response in an instructional intervention known as the Cultural Modeling Project. As Lee (2001) explains it,

> Signifying…involves innuendo, double entendre, satire, and irony, and is dense in figurative language. It often involves forms of ritual insult, but is not limited to insult. An example of signifying might be 'Yo mama so skinny she can do the hula hoop in a cheerio.' (p. 122)

Although signifying is valued for language play in its own right, Lee (2000) used underachieving adolescents' tacit knowledge of this discourse form to help them hypothesize about the meanings of canonical texts (e.g., their tropes, ironies, and satires) and to change their hypotheses as evidence warranted. She took on the role of more knowledgeable other, as defined in Vygotsky's (1986) zone of proximal development, in

order to guide and support her class of underachieving ninth graders as they learned to bridge differences in home and school cultural practices using a language form that was both spontaneous and reciprocally honed in the service of literary analysis.

The Cultural Modeling Project, though designed especially to assist struggling readers in literature classes, has applications across subject areas. For example, Ballenger (1997) worked with a multi-grade (5-8) Haitian bilingual science classroom in which multiple strands of meaning and intention surfaced during class discussions that facilitated students' entry into a formalized way of talking science. In this instance, it was the Haitian style of argumentative discussion that scaffolded students' participation in the scientific discourse of the classroom. Briefly, argumentative discussion, a prominent feature of everyday adult interactions in Haitian society, involves animated debates about politics, sports, religion, and the like. Often engaged in purely for entertainment purposes—much like signifying—argumentative discussion contains elements of scientific discourse, such as constructing a relationship between evidences and claims. It is a discourse acquired by younger members of Haitian and Haitian-descent society as they first observe (and later participate in) this storytelling genre. In the inquiry-based bilingual science classroom that Ballenger described, children were encouraged to express themselves in both Creole and English as they used culturally familiar rhetorical skills to present their arguments and defend their personal opinions about various subject matter topics (e.g., the conditions necessary for mold to grow).

Although culturally mediated approaches to learning, such as those described by both Lee and Ballenger, are supported in the research literature—indeed, the work of Osborne, Simon, and Erduran (2002) finds support for teaching and learning argumentation in science classrooms—working within these approaches is by no means a seamless process. As Gee (2001) has argued elsewhere, acquiring a scientific discourse means (among other things) giving up certain aspects of one's everyday language. It also entails moving beyond the face-to-face discussions that were so central in the Ballenger study. Neither of these moves would seem easy to orchestrate, and the potential demands on anyone seeking to do so would seem to influence greatly one's decision to venture (or not venture) into the realm of scientific discourse and its attendant processes, such as argumentation, problem solving, and the like. For example, what might it take to motivate interest in problem solving in an underachieving 14-year-old boy whose struggles with reading in subject matter classes had become a stopping point in terms of his willingness to engage with school-related tasks of any sort? I explore this issue in part through analyzing Ned's approach to problem solving in an informal out-of-school context called the media club (Alvermann, Hagood, & Williams, 2001).

Ned: A Case Study

Ned was in eighth grade when we first met him. He was one of 30 adolescents (all but 4 were African Americans, including Ned) who had volunteered to participate in a 14-week media club study during after school hours in the public library, which was

located adjacent to the middle school where Ned was enrolled. The purpose of the study was to learn about the kinds of literacy practices these youths would bring with them to the club, which met 3 days a week and involved 10 participants at a time. All 30 were considered by their schools to be underachieving students due largely to their struggles with reading in their subject matter classes.

According to school records, Ned had scored in the lowest quartile on the district's standardized reading test. Ned played football for a few weeks in the fall of 1999, but when his grades began to drop, he was cut from the team. From our first interview with him, it was clear that he had a passion for sports and envisioned himself going on to play football one day for the University of Georgia. Along with his affinity for sports, Ned loved rap music. A self-styled rapper, Ned had formed his own rap group and had created a home page for it on the Internet (which, to preserve Ned's privacy, is not linked here). Known as the *M-L-P Boyz* (Major League Player Boys), the group consisted of Man (aka Ned), L'il Thug, Tron, and G-money. Together, they composed raps that they subsequently committed to memory and performed for special occasions. But Ned's major interest in rap centered on the Atlanta-based group *The Goodie MOb*, an acronym for "The Good Die Mostly Over Bull," whose members include Big Gipp, Khujo, T-Mo, and Cee-lo.

Kevin Williams, a graduate student at the University of Georgia and a member of our research team, learned that Ned liked *The Goodie MOb* and wanted the rappers to be the focus of his "freedom activity" (a term Ned coined to distinguish his self-selected club project from the work selected for him at school). Kevin, who had been a high school classmate of Big Gipp, Khujo, and T-Mo, volunteered to help Ned learn more about *The Goodie MOb*. He identified with Ned's interest in rap groups because in high school in the 1980s, Kevin had listened to *Public Enemy*, a group whose critique of the establishment and socially conscious lyrics were similar to *The Goodie MOb's*. The fact that a 14-year-old youth was interested in socially conscious rap intrigued Kevin; thus, he invited Ned to e-mail him with a question—the first step in the problem-solving "freedom activity" that Ned had selected for a club project.

In writing to Kevin for the first time, Ned strategically positioned himself as one who was knowledgeable about different kinds of rap. For example, he signaled that he knew *The Goodie MOb* was known for its lyrics about society's ills from the perspective of those who live in certain urban areas in the United States known colloquially by their residents as "the 'hood." He also indicated an interest in learning factual information about the rap group.

Monday, 25 October 1999

> My favorite rap group is Goodie MOb because they talk about life and the sciety in there neighbor[hood] like for enstance the song I think should describe them is SKY HIGH because that's like a fact in life. If you would

listing to their songs you would know that they rap from the hart. Could you give me some kind of facts about them?

Sincerely, Ned

Kevin responded to Ned's request for factual information and made it clear that in exchange for this information, he expected Ned to e-mail him regularly and to keep him informed about what he was learning. In short, it was established early on that engaging in this problem-solving activity entailed responsibilities on both their parts.

Wednesday, 3 November 1999

I hear you like my home boys, Goodie MOb! I will help you with your project. One condition is that you have to e-mail me and keep me informed. Today I will start with a little basic information about the members of the group.

All of the members are from Atlanta, Ga. They all attended Benjamin E. Mays High School. Named after a great Civil Rights educator in Georgia, B.E. Mays was once the President of Morehouse College.

Today I will start off with information about Khujo, my closest friend out of the group. Khujo's real name is Willie Edward Knighton. In high school we nicknamed him the Nightmare or BIG WILL because he played linebacker for Mays and used to really hit people hard on the field. In high school his homeroom was 9-5-12-5 which we both were in together all four years. Our homeroom teacher was Mrs. Ward. Both Willie and I were close to our homeroom teacher. Willie was raised by his mother only and grandmother on occasion. He has a little brother named Marcus Knighton who also went to Mays and graduated in 1992. Willie and I graduated from Mays in 1990. We are currently planning our 10 year class reunion where we hope to try to have a benefit concert for Mays in 2000. While in high school, Willie was a great student. He always had good grades and loved to read and have fun. Willie "Khujo" Knighton won Most Attractive his senior year.

The next time I write I will tell you a little more about Khujo in terms of when he started rapping, but I will give you a hint. It was before high school. I will also write about another member in the group.

Sincerely,

Kevin PEE-WEE Williams

By dropping a hint as to when Khujo started rapping, Kevin hoped to motivate Ned to provide some input of his own as part of the problem-solving process. Over the next week and a half, we noticed that Ned's strategy for acquiring facts about *The Goodie*

MOb (and especially information about the group's latest CD release, *World Party*) changed dramatically. Rather than depend on Kevin for his information, Ned began searching the Internet on his own and sharing what he learned with Kevin. In an e-mail thanking Ned for passing on tips about some useful *Goodie MOb* Web sites, Kevin did more than simply express his appreciation—he also indicated that he took action by following up on Ned's recommendations:

> Monday, 15 November 1999
>
> I appreciate you giving me the web sites. I have enjoyed looking them up. My home boys are coming real good with their new album called World Party! I hear that one of your favorite members is T-Mo. I am good friends with him as well. I will write you something about him if you would like. E-mail me some questions about him and I will try to answer them. One other thing I want you to do, is to look at the cover and credits of Goodie MOb's first album and find out the names of the people they dedicated the album to. E-mail me back the names you find in the dedication. By the way the first album...was Soul Food, which I know you probably know. I look forward to hearing from you.
>
> Kevin Pee-Wee Williams, M.P.H. [Master's in Public Health]

In re-introducing the need to ask questions—this time about T-Mo—Kevin was able to model for Ned that problem solving does not stop after the first question is answered; instead, it is an iterative process, with one question leading to another. Note, however, Ned's unexpected response to Kevin's offer to supply information on T-Mo:

> Monday, 15 November 1999
>
> Dear Kevin,
>
> I would like to know more about c-loe because I think he knows how to rap better than the rest. I ain't trying to put the rest down but I think he has more charicteristics in his raping style his style is creative. I can't tell you the dedacation because I have not seen it yet because Mrs. Donna is going to buy it this week and I'll answer your question next week.
>
> Ned Bluffton, AKA=MAN

In (politely) rejecting Kevin's offer to supply information on T-Mo, Ned gives his reasons for preferring to know more about a different member of *The Goodie MOb*, Cee-lo. This response came as a surprise to both Kevin and me. We found it interesting that Ned entered into an argumentative mode by citing evidence—"he (Cee-lo) has more characteristics" and "his style is creative"—for his claim that Cee-lo "knows how to rap better than the rest." In terms of the question about the dedication that Kevin raised, Ned did indeed have to wait until the following week when I was able to purchase a copy of

The Goodie MOb's first album, *Soul Food,* and bring it to media club. After searching for (and finding) the credits on the CD's insert as he listened to the rappers on the club's boom box, Ned e-mailed Kevin the following message:

> Monday, 22 November 1999
>
> the dedication was to King Bean, Barak, Tank, Aticia, Quinton, Brandon Williams, and Easy E. Is Brandon Williams related?
>
> From: Ned AKA "MAN" BLUFFTON

Ned's question "Is Brandon Williams related?" triggered a long and thoughtful response from Kevin, only portions of can be included here:

> Monday, 13 December 1999
>
> Ned,
>
> You did a good job doing the research on Soul Food. The names in the dedication helped to inspire the lyrics in some of the songs on the CD Soul Food. Particularly the song called "Pall Bearers." In that song the group expresses their frustration with having to serve as pall bearers at a couple of good friends' funerals.
>
> For example, T-Mo served as pall bearer at King Bean's funeral. Bean is one of the persons the album was dedicated to and was a good friend of T-Mo. King Bean graduated a year before me (in 1989) at...Benjamin Mays in Atlanta.
>
> Two of the names that were real personal to me were Brandon Williams and Barak Martin. Barak was shot and killed in 1993 in front of The Beautiful Restaurant. Barak graduated with me and 3 members of Goodie MOb in 1990 from Benjamin Mays. Barak was my best friend and in the same homeroom with Khujo and myself. We spent a great deal of our time together.... We excelled in sports and in school and were known to have a lot of fun.
>
> The other name that is personal to me is Brandon Williams, my brother. A year after Barak was shot and killed in 1994 my 17 year old younger brother was shot and killed while I was away at Florida A&M University in Tallahassee, FL. When I returned for the funeral the whole Goodie MOb group came by my house and offered support. I was extremely honored when Brandon was named one of the people they dedicated the album to.

> I have enjoyed e-mailing you. I wish I would have had more time to answer more of your questions, however, I would like to get your home address and telephone number so [we] can continue to correspond.
>
> In conclusion, although this story seemed a bit sad, I have persevered through the tragedy. For example, I returned back to school within a week and a half of my brother's funeral and went on to graduate from Florida A&M with a B.S. in Criminal Justice, and went on to graduate with a Master's in Public Health from Morehouse School of Medicine in Atlanta. And, also, I'm now in school at the University of Georgia. I'm studying to be a professor of Social Foundations and run a youth non-profit organization.
>
> P.S. To this day I'm a Goodie MOb supporter. So make sure you go out and buy their new album "The World Party" on December 21. Your last bit of homework is to look up which members of the group gave me a shot-out in their personal thank yous in the "Soul Food" album. My nickname is Pee Wee.

The congratulatory tone of Kevin's opening paragraph (coupled with his request for additional contact information so that he could communicate with Ned after the media club project ended) may have reinforced for Ned the importance of committing to the "freedom activity" and seeing it through to the end. It may also have contributed to his reply below. To give a context for this reply, it is important to note that Ned made a special trip to the library on Tuesday, a day when the media club did not meet. We later learned that he had missed part of basketball practice on Tuesday so that he could go to the library and reply to Kevin's message.

> Tuesday, 14 December 1999
>
> Hi Kevin,
>
> It's Ned. Thank you for telling me who was the dedication to. I thought that was a bad situation that your brother was in and that you were in too. But thanks for telling me about who Brandon Williams is and the research. I want to keep in touch. My address is [withheld here to maintain anonymity] and my phone number is [withheld here to maintain anonymity]. Please write. From Ned

Putting Everyday Literacies to Work in the Service of Classroom Learning

What can we learn as science and literacy educators from Ned's interest in *The Goodie MOb*? As noted earlier, I am interested in how underachieving (struggling) readers approach learning in contexts other than those associated with formal schooling. Part of my motivation for doing this kind of research is to figure out what might be learned about their everyday literacies that could be put to work in the service of

classroom learning. I say this, however, with some trepidation because I do not mean to imply that I favor appropriating Ned's nonacademic literacies for academic purposes. Co-opting the very spaces in which struggling readers are already making meaning and exercising some degree of agency over the questions they ask and the problem-solving activities they engage in would indeed be counterproductive. At the same time, it seems to me that to ignore what the Neds of the world can do in the name of science after school would be equally ill founded. What I suggest, therefore, is an interpretation of Ned's case that encourages thinking about the overlaps in self-initiated questioning and problem solving that occur both in and out of school—not for the purpose of importing one into the other, but simply as a means of gaining a better perspective on how underachieving adolescents approach learning in different contexts.

First, the out-of-school setting: The strategies Ned used to obtain information about his favorite rappers, *The Goodie MOb*, demonstrate a reliance on his own experiences and on certain kinds of "literate currencies" (Obidah, 1998, p. 52) that had worked for him in the past (e.g., his Internet browsing skills and familiarity with rap, his Web-page authoring skills that allowed him to feature his own rap group, the *M-L-P Boyz*). It was Ned's command of these literate currencies that afforded him the opportunity to act like—and just as important, to be recognized as—a competent and literate person in the media club setting (Gee, 1996). This was quite different from how he was perceived (and no doubt perceived himself) in school.

In media club, Ned had access to adults who served more as facilitators than as teachers. With the exception of Kevin Williams, no one else on the six-member research team was that knowledgeable about the topic he selected for his "freedom activity." Thus, Ned was situated as the more competent reader and writer amongst the other five of us. This afforded him opportunities to explore what he found interesting and compelling about *The Goodie MOb* on his own terms. From the start, he approached his media club project with a strong sense of purpose: he asked questions of Kevin, he fielded Kevin's questions, and he shared what he learned about *The Goodie MOb* and its music, largely as result of Kevin having established early on that he expected to be a learner as well as a teacher. Ned's sense of purposefulness in the problem-solving "freedom activity" manifested itself in other ways as well, some of which could be viewed as thwarting the goals of school literacy. For example, he never asked for help with spelling when he e-mailed Kevin, and his seeming inattention to spelling errors resulted in some of the same words being spelled correctly one day but not the next. Difficulty in spelling also led him to make numerous errors when searching for information on the Internet.

Perhaps the most valuable learning to have come from *The Goodie MOb* project was the fact that both Ned and Kevin successfully positioned themselves as learners and teachers—though sometimes more the learner, and other times more the teacher. That Ned succeeded in getting the adults in media club to pay attention to his questions and to take them seriously is no small feat, especially given the power relations often at play in the adult-run world that adolescents inhabit. Consider, for instance, in the following in-school example, how Ellis and Jackson—two African American boys about the same age

as Ned and living in the same geographic region—experienced a somewhat different response to their self-initiated questions. Although Mr. Mack, their teacher, seems to have taken the boys' questions seriously, there is a hierarchy at play here that precludes the teacher from taking up the position of learner, if even temporarily.

Ellis: Uh, uh, I was gonna ask you a question.

Mr. Mack: Okay, hold on. First, let's answer this [a question on a worksheet] and then I'll get to your question. What's gonna form? I want you to answer this question anyway. The male releases a Y sperm and it unites with the female's ovum; what type of baby will be born?

Ellis: A male?

Mr. Mack: Okay, a male. All right, what's your question?

Ellis: [*clearing his throat*] So it looks like, when the male—the male's sperm has a lot to do with the decision…cuz the X chromosome is the female and the Y chromosome is the male; so the male really controls the sex of the child.

Mr. Mack: Good, that's exactly right. So the father's [*draws on board*] sperm decides whether that baby 's gonna be male or female.

Jackson: So it really doesn't matter what the female sends out?

Mr. Mack: Well, don't picture it like that because see when the male—the male ejaculates, he ejaculates 50% of both, but it's the…

Jackson: [*interrupting*] Okay, the reason, it depends on the …

Mr. Mack: [*interrupting*]: Right, and remember, the egg will receive how many sperm?

Jackson: One. (Alvermann, O'Brien, Dillon, 1990, p. 305)

Like Ned, the two boys in this excerpt were seeking answers to questions derived from their curiosity about everyday life. On one level this qualifies all three boys as participants in scientific inquiry, at least as defined by the National Science Education Standards (National Research Council, 1996, p. 22). Though different from the type of learning Ned enjoyed, that which Ellis and Jackson experienced would seem a definite improvement over the rote learning described in the earlier classroom example on kilograms and millimeters. Ned's approach to learning in media club seemed more akin to what Gee (2002) describes as an "affinity group" arrangement:

> An Affinity Group is a group wherein people form affiliations with each other, often at a distance (that is, not necessarily face-to-face), primarily through shared practices or a common endeavor (which entails shared practices), and only secondarily through shared culture, gender, ethnicity, or face-to-face relationships. (p. 65)

While at first blush, such an arrangement (for greater elaboration of the Affinity Group in relation to video game learning and learning in science classrooms, see Gee, in press) might seem quite removed from present-day reality, I would venture along with others (Dimitriadis, 2001; Fine et al., 2000; Gee, 2002, in press) that it is foolhardy to assume the model of schooling in vogue today will be relevant as we move through this century. If changes in the overall model occur (as I think they must), it seems reasonable to assume that what counts as scientific literacy today must also change. In fact, Lemke's (1990, 1998) claim that students must be shown not only how to talk the specialized verbal language of science but also how to integrate different modes of representation (e.g., visual, symbolic), if they are to learn to reason and act scientifically, would seem to support such a move. It would also seem to support Internet-mediated learning not unlike what Ned experienced to some degree and what Gee (in press) so elegantly lays out in *Power Up*, a book about (among other things) the countless ways in which learning in video game environments is relevant to literacy teaching and learning in science classrooms.

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