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Preparing Adolescents to Read-To-Learn in the 21st Century[1]

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Introduction

In this brief essay, we lightly traverse a broad intellectual terrain. We bring in to close contact, notions that are not traditionally discussed together. We open with a discussion of adolescent reading. We go on to couple that with unfolding workforce requirements for the 21st century. We suggest how the educational needs of this workforce might be better met by paying closer attention to the opportunities to learn presented by inquiry-centered learning environments in schools. We close with a specific set of suggestions about how these learning environments might be better coupled with the support of reading and literacy. We embark on this rather broad sojourn to highlight a rather old adage – in Dewey's words; schools should be seen not as preparation for life but life itself. In this case, life in 21st century United States will demand that its inhabitants be flexible thinkers and expert communicators. All adolescents, but especially those from underserved communities, will need to understand how the texts from various disciplines will help them develop expertise with text that they will value throughout their lives.

We are especially interested in exploring ways to remedy adolescents' failure to acquire reading-to-learn skills. During the K-3 years, schools expect that children will learn to read. That is, children will learn to decode and comprehend a relatively narrow range of texts. From 4th grade forward, schools and teachers have a different expectation. The expectation is that readers will have the requisite skills necessary for reading-to-learn. With decoding and the basic skills in reading accomplished, most learners from roughly fourth grade forward, use reading as the most fundamental tool in learning. From early adolescence throughout the life course successful learners apply reading-to-learn skills to newly encountered text in school, in the workplace, on the Internet – in short, everywhere – to learn. For this essay, and following several others (e.g. Pressley, 2000,1989; Yore & Shymansky, 1997), we consider the following as a useful (but incomplete) list of reading-to-learn sub-skills: (a) Defining, (b) Summarizing, (c) Information retrieval, (d) Serializing, (e) Analysis, (f) Synthesis (g) Reflection. These skills are both very general and highly specific. They are general in that learners find them useful in every domain. They are highly specific because they will look somewhat differently depending on norms of domains of expertise and inquiry in each domain. For example, the important elements of a series in social studies are different that those in science. However the learner in each case must be sensitive to the importance of series in understanding the

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text. A reading-to-learn suite of skills is a meta-cognitive toolbox that allows learners to understand and use texts. Insuring that early adolescents master reading-to-learn is one key way to guide them to productive adulthood in the workforce of their future.

We conjecture that the failure to develop deep reading-to-learn expertise will diminish students' life chances (Deshler, Ellis, & Lenz, 1996; Hagell, Rutter, & Yule, 1994; Schumaker, Deshler, & Ellis, 1986; Zigmond, 1990). The 21st century will place a premium on activities, for which reading-to-learn is a prerequisite. Reading-to-learn is important for all students. We suspect highlighting this suite of skills is especially important for minority students. It is apparent that many minority students leave late childhood and enter adolescence with poor decoding skills and weak vocabulary. Indeed this deficit is receiving attention. We suggest that reading-to-learn is at least as important and perhaps more for each learner's future than simple decoding.

The United States workforce is undergoing radical change. For the foreseeable future the job growth in the US workforce will be dominated by two sectors: professional and related occupations and service occupations (Bureau of Labor Statistics, 2005; Levy & Murnane, 2004). Both types of employment demand strong communication skills so that complex ideas can be shared across diverse communities. Additionally the economy of the 21st century will require its members to think creatively and critically while responding to, and adapting in response to, rapidly changing situations (Levy & Murnane, 2004). Employees in these sectors are the leading edge of a trend away from strictly structured and rule-governed work environments in which employees have little latitude for decision-making, restricted reporting, and limited collaborating spheres. Increasingly, greater numbers of employees across a broad spectrum will be expected to do the thinking, documenting, and communicating necessary to sustain and grow their organizations in a global and dynamic economy. The new economy will need workers of this sort at all levels whether they are entry-level service workers or senior design analysts. Drucker (1998) coined the term "knowledge worker" to character this new type of employee. Today's schools must prepare the workers who will fill these new forms of work. At the foundation of these workers' skills sets is reading-to-learn.

Developing a Learning Culture for Future Knowledge Workers

More than a decade ago the SCANS (Secretary's Commission on Achieving Necessary Skills) report (1991) anticipated this trend in employment and the demands it would make on systems of teaching and learning. Among other things, the report suggested that for today's students to be prepared for tomorrow they would need learning environments that allowed them to explore real-life situations and consequential problems. The authors of the SCANS report believed learning environments with these characteristics would help learners become prepared for the work world of the new century.

More recently the insights of SCANS have been echoed in scholarly (e.g Levy & Murnane, 2004) and policy discourse (e.g NCREL EnGauge, 2004; Partnership for 21st Century Skills). In the spirit of the SCANS report, the current conversation about 21st century skills calls for classroom learning environments that, in addition to including the core subjects of schooling, encourage students to gain media literacies, critical and

systems thinking, interpersonal and self directional skills.

Creating classroom cultures where this is possible involves developing students' abilities to create, process, and share information. These classroom learning activities that use intellectual resources, offer learners the opportunity to engage in knowledge creation and knowledge transformation. Text and reading are at the center of all these activities. Reading-to-learn is an essential skill for learners to take advantage of the opportunities. Reading-to-learn is at the core of expert thinking and complex communication - the overarching names that Levy and Murnane give to the set of skills at the core of productive participation in the 21st century. These skills – expert thinking (i.e., critical analysis and synthesis of information) and complex communication (i.e., transformation of information into new forms for interaction with others) – are what knowledge work is about.

What is needed: Strong Literacy Skills Developed Within Authentic Learning Opportunities

Centrality of Text and Reading-to-Learn

Complex communication skills and expert thinking rely on the presence of highly developed reading-to-learn skills. These skills are fundamental tools for knowledge acquisition and communication. Employees and students who have highly developed reading-to-learn skills typically show evidence of good self-monitoring of comprehension, critical thinking, strong analysis and interpretive skills, and they are able to communicate detailed and relevant information for others. Highly developed reading-to-learn skills can be thought of as the core skill set necessary for effective functioning as a student and as a knowledge worker.

These core skills take on nuances in each domain of inquiry and students must learn and apply these skills across subject areas. Our conjecture is that skills including defining, information retrieval, serializing, analysis, synthesis, and reflection provide students with a set of tools that can be applied across disciplines. With these skills, students can effectively tackle challenging and interesting problems across domains. They will also be much better prepared for the workforce demands of an information economy. Therefore, classroom learning environments, across domains, must find ways to highlight and teach these skills.

Teachers often equate evidence of basic literacy (e.g. decoding) skills with the reading-to-learn skills necessary for rigorous work in the disciplines. Some teachers assume that students have learned basic skills before reaching middle and high school and that these students can apply these basic skills to the more rigorous critical investigations and deep analysis of text required in grades 4-12. The effective application of reading-to-learn skills for knowledge work relies on the presence of strong basic literacy skills, but it is not a substitute. The presence of strong basic literacy skills is a partial precondition for reading-to-learn skill development. Students with very weak basic literacy skills require such long periods of time to read texts that they become lost and lose sight of the metacognitive structure in texts. However, even students with minimal basic literacy

skills can be taught to use reading-to-learn strategies. The skills may even serve to deepen their basic literacy skills.

The overarching goal in our research, design, and implementation efforts is to support students in developing the reading-to-learn skills necessary to compete in the 21st century labor market. To be competitive, students must be expert consumers of text and other media for knowledge work. We argue that the development of these skills must necessarily be integrated with the development of students' engagement in authentic activity of the kind that can occur in the subject matter classrooms of high school and middle school. In short, we are seeking to create techniques to assist content area teachers, using the texts of their disciplines as sites, to support the development of reading-to-learn skills in their students.

Apprenticeship in Text Thick Authenticity: Meaningful Learning Through Authentic Activity

High school teachers often read complex text to students. The argument for this practice goes like this: "In order to do the work, the kids have to read. The kids can't read. So to get on with the work, I read to them". While it is certainly true that students have to read to do complex content-area work, unlike the foregoing strategy, we conjecture that teachers do not have to adopt a learning *before* doing posture. Rather, following progressive educators since Dewey (1938), Whitehead (1929), and others, we think it is essential for high school content teachers to adopt a learning *while* doing stance when it comes to content-area instruction and reading. The key question is how to develop reading-to-learn skills through authentic classroom activities. Further, as is nicely illustrated by Norris and Phillips (2005), the acts of reading and writing, themselves embody the keys to inquiry. That is, being able to understand how information is communicated within particular genres, like specific disciplines in science, is at the very essence of what it means to know these disciplines.

One instructional site for developing these reading-to-learn skills is participation in inquiry science activities. In inquiry, students work on consequential tasks in specific domains. In addition, students have opportunities to participate in communities and tasks that are personally meaningful. During inquiry activities, students ask a question that can be investigated. Students then develop a hypothesis and initiate an inquiry. These tasks require deep involvement with text. Inquiry includes what Palinscar and Magnusson (2000, 2001) have called first and second hand investigations using text and hypertext for research and documentation within the inquiry process. During inquiry, students analyze and synthesize the results of their inquiry and typically present their cases, from evidence, to their peers and teachers. Students are encouraged to recognize and consider possible and plausible alternative explanations. They interrogate these explanations in collaboration with other students . Said differently, during inquiry students develop skills at the higher levels of Bloom's Taxonomy (1956) including classifying, inferring, predicting, and communicating.

One key vehicle for this development is text. Text and other media are windows through which the domains of knowledge can be viewed. Through deep involvement with text students not only learn content but how reasoning unfolds in the various content areas. In reciprocal fashion, this sort of engagement with the texts of the domain develops reading-to-learn. This interplay is one key aspect of authentic activity.

Shaffer and Resnick (1999) suggest learning involving deep and long term activity in content areas is at the core of authenticity. When carried out in ways that engage high-level thinking, inquiry requires thick authentic activity. They go on to identify four interdependent and mutually supporting aspects of authenticity. These aspects of authenticity are: (1) learning that is personally meaningful to the learners, (2) learning that relates to the real-world, outside of school, (3) learning that provides an opportunity to think in the modes of a particular discipline, and (4) learning where the means of assessment reflect the learning process. Learning in this thickly authentic way always requires a constant interplay between acquiring content and, as far as reading is concerned, developing highly situated skills to better read and process information from the domain. Inquiry in science, for example, because of its local and community interactions with big ideas and processes, and its engagement with the communicative forms of science (reading, documenting, synthesizing, and reporting about science learning), is particularly well suited to support thick authentic activity in science. To be a fruitful learning-while-doing site of instruction, however, a specific set of practices for teachers and learners is needed to keep the interplay visible during inquiry.

Now we turn to how text can be used to engage learners with inquiry as they develop reading-to-learn skills. We focus on science but we believe that these arguments can be equally well applied to other domains of inquiry. The many sub-communities of science have defining text genres. Whether we are discussing the highly local forms like the texts teachers may use to get students to specify research questions, or the texts of professional societies, communities produce texts that represent how science is defined, interpreted, and communicated. In order to truly develop deep scientific conceptual understanding, while learning how to *do* the work of inquiry, students must be effectively engaged with local and global community science texts including primary documents (e.g., technical reports), secondary texts (materials created by science writers for educational distribution), curricular materials, and local community documents. Effective engagement with text within a domain implies access, skill, and recognition. Students need access to a range of texts that represent the community and its domain. Students also need the skills to attend to these texts deeply. Finally, students need meta-cognitive strategies to recognize relevance of the texts' content to the investigative approaches and phenomena that are the subject of the inquiry.

The Challenge: Strengthen Literacy within Inquiry

We conjecture that lack of reading-to-learn skills is behind much of the poor performance in content area domains. Students have not developed specific meta-cognitive techniques to appreciate the nuances in the big ideas of domains. In short, for many learners the big

ideas are invisible. Here our reasoning takes its lead from Delpit (1995). She argues that learners, especially those from disadvantaged backgrounds, don't really get the specifics of the games of learning that are at work in classrooms. One place the game of leaning is played out is in text. Each content domain has its own way of learning and styles of reasoning. These can be seen in the ways documents are structured both globally and locally from elements like heading structure to the use of special vocabulary (Bolter, 1991). If learners do not have a way to make these visible, they can fail to see how the important ideas in a domain unfold. The challenge is to offer learners specific techniques to navigate and come to conclusions from content area texts.

Our work is focused in science classrooms. However, the demands of modern inquiry-centered classrooms are duplicated across the curriculum. Content areas, like science, demand of learners the application of skills that support the acquisition of deep conceptual understanding. Genuine and authentic application of these skills requires presenting students with opportunities to applying core skills to authentic conceptual and procedural tasks. Inquiry-centered science classrooms require students to read-to-learn in order to engage in the essential tasks of inquiry. Students must be able to read and interpret information from multiple sources and extract information that is necessary and appropriate for inquiry goals. They must be able to use computational technology to locate, synthesize, and analyze information in order to build evidence. Finally, they must be able to write and speak in ways that represent their understandings of argument and evidence and then, in turn, be able to communicate factually and persuasively with peers. When students are not highly skilled readers the foregoing activities are at best compromised and at worst impossible.

We have introduced several reading-to-learn support tools into inquiry-centered science middle and high school classrooms. Our goal is an intensive reading-in-science infusion that provides students with tools to support the development of skills that are necessary for expert thinking and complex communication. Our suite of reading-to-learn support tools includes (1) annotation, (2) double-entry reading logs, (3) summarization, and (4) sets of considerate texts whose structure and content is well-understood and connected to learners' current reading levels. Each of these tools supports knowledge transformation in which text information is actively reworked to improve learners' understanding. This is accomplished through support for individual reflection and reorganization. Through the use of the tools, we believe that learners develop an interconnected understanding of science concepts and the scientific procedures (questioning, documenting, analyzing, reporting) that help students gain deeper understandings of the concepts.

Annotation

Students need ways of making the author's message more explicit. Text annotation meets this need. Annotated texts are readings that have been subjected to content analysis. Annotated texts serve as a guide for reading and readers. Teachers use these guides as they scaffold readings for their students. Our approach to content analysis involves coding that make main ideas, supporting ideas, difficult content and other vocabulary, transitions, conclusions, and inferences implicit in the text more apparent to

learners. We also highlight explicit or implicit hypotheses, claims, evidence, inference, predictions, evaluations, and integration, all of which are critical science skills that the Illinois Science Standards (1985) identify as necessary for 9th and 10th grade science learning.

Science texts seen in this way allow learners to "see" the hypothesis, claim, evidence, inference, etc. that are often not explicitly pointed out in the text. In addition to simply having students read annotated text, we also intend these categories as a guide for students as they learn to annotate or "mark up text" while actively reading. Annotation is one component to becoming an expert and active reader. Our goal is to provide students' with the tools necessary to become expert and active readers. Using annotation, students can regularly make notes in the margins and mark-up texts, insert number or letter guides, underline, etc. as they locate the main ideas and track the arguments in the text.

Double-Entry Reading Logs

Double-entry reading logs are a reader-response workspace that provides a structure for students to monitor and document their understanding of science texts. Double-entry logs are an opportunity for students to read actively and reflect on their reading using sets of annotations designed to get learners to highlight particular places of difficulty in the texts. The variety of double-entry reading log structures allow teachers to focus students' reading on a particular idea or skill (vocabulary, main ideas with supporting ideas, etc.). For example in a vocabulary double entry log students are asked to identify new words and conjecture how they are related to the main ideas of an inquiry. We coupled the double entry log to the use of summarization. It helps students first understand and then explain what they read in science texts.

Summarization

Effective summarization, capturing the gist of science text as well as the major concepts and details supporting those concepts, is an important skill in science inquiry. In summarizing, students must comprehend the text, identify main ideas, differentiate secondary ideas, and condense the information while integrating essential elements in a written text that is a succinct, logical, and coherent representation of the original source. In our reading-to-learn approach in science, we give students opportunities to summarize the text in two ways: first, through teacher-guided summarization skill development and second, through the use of the Summary Street tool.[4]

[4] Summary Street uses a set of mathematical and statistical techniques called latent semantic analysis to create a representation of students' text and compare it to stored representations of texts from the same domains of inquiry. Summary Street judges the student's summaries based on the similarity of its concept and concept structures to stored corpus of texts. Summary Street also assesses things like redundancy, plagiarism, spelling, and text length. To learn more about how Summary Street scores texts see (Kintsch, et.al., 1998; Landauer, et.al., 1998). See (Wade-Stein, et.al., 2005; Kintsch et.al., 1998) for a report on student use of Summary Street.

The Summary Street tool is a web-based tool that supports student summarization by giving feedback on content, spelling, redundancies, and irrelevancies. The goal of the integration of Summary Street into the curriculum unit activities is to engage students in a deeper understanding of important texts they have read. Writing summaries provides students with an opportunity, through writing, to communicate their understanding of text. The Summary Street tool provides students with instant and private feedback on the quality of their summaries. It provides teachers with the opportunity for one-on-one interaction with students

The foregoing description of reading-to-learn support tools serves to illustrate tools that might support students in becoming more active and expert readers of content-area text. Teachers must have opportunities to become familiar with, and build pedagogical skills in the coupling of reading-to-learn approaches, and reading-to-learn tools with their current approaches to teaching in the disciplines. In order to facilitate this transition, specific forms of professional development are required.

Professional Development

In order to create twenty-first century learning opportunities for students, teachers must be 21st century knowledge workers. Knowledge work is understood to comprise the creation of knowledge, the application of knowledge, the transmission of knowledge, and the acquisition of knowledge (Kelloway et al., 2000). Much of knowledge work involves meaningful interaction with text forms. In light of our reading-to-learn discussion, it follows that content area teachers should be facile in using text to meaningfully focus and deepen instruction.

In our professional development regime we are working to assist science teachers in becoming skilled in using text as an effective means of active instruction rather then just the object of rote memorization. Through ongoing professional development, teachers have regular opportunities to consider, share, and critique their role in preparing students for knowledge work in general, and more specifically, in examining opportunities to bring literacy to content teaching as a key component to development of knowledge workers.

Engaging in knowledge work through supporting literacy within science has substantial challenges for teachers. One challenge to the development of reading-to-learn skills is that teachers are unfamiliar with, and lack specific knowledge about, how to use the texts of the content jointly as sites for reading instruction and content instruction. Science teachers have not typically been exposed to reading-to-learn approaches to teaching science content. When teachers have been presented with information about how to support literacy in science it has generally taken two forms: broad (i.e., an overview of the importance of supporting literacy in science) or scattered (i.e., multiple activities or techniques e.g., graphic organizers, KWLs) without direct connection to specific content or to pedagogy appropriate to the technique. Teachers must have opportunities to learn the rationale and theory underlying selected reading-to-learn approaches. The theory

should be to coupled to specific and supported opportunities to practice doing the work of teaching with activities that connect the reading to science content.

Our approach to professional development offers a combination of theoretical and hands-on knowledge building, knowledge application, and knowledge transformation that is critical to building long-term capacity in supporting literacy in science in high schools. We introduce teachers to the explicit strategies that students will use in applying reading-to-learn skills to science text. We prepare teachers to "see and support" the literacy in science text and to develop their students' reading-to-learn knowledge and skills in science focusing on highlighting the text structure that wraps around content. In order to effectively integrate reading-to-learn tools into science classrooms, we bring together three critical ingredients: highly developed and vetted text-rich inquiry science curricula, reading-to-learn metacognitive support tools (annotation, double-entry reading logs, summarization), and expertise. The design of the scope and sequence of our professional development approach aims to 1) provide teachers with an overview of the reading-to-learn theoretical approach to supporting literacy in science; 2) provide deep and interactive opportunities for exposure to reading-to-learn and to the literacy materials and tools in the unit; 3) provide regular skills training in the use of the materials and tools relevant to the science lesson; 4) encourage meta-awareness of the rationale underlying the application of reading-to-learn approaches in science; and 5) provide opportunities to apply their understandings to the design of formative assessments that measure students' developing science understanding through the use of the literacy materials and tools.

Conclusion

We have described the pressing need for schools and teachers to develop students who know how to read-to-learn. We have claimed this is fundamental if students are to develop into effective knowledge workers in the 21st century. We offered a brief characterization of our reading-to-learn approach to supporting literacy and skill development as a vehicle for preparing students for their futures. We have highlighted inquiry science as a context for creating authentic opportunities for students to develop and apply these reading-to-learn techniques. What are the implications of this discussion for the preparation of students, especially for those who are performing at lower-than-hoped-for expectations? While the implementation might be complex, we believe the implications for the schooling of adolescents is straightforward. First, we think that broad-based efforts to make text more prominent in the instructional lives of teachers and learners should be redoubled. As we have tried to argue here, adolescents and teachers see text every day but do not see text as an active and deep meaningful ingredient of learning in the content areas. Most adolescents think they already know how to read and, thus, what more could be necessary? Most teachers believe the adolescents who come to them know how to read and that their instructional foci should be elsewhere. These perspectives jointly conspire to keep text below the instructional radar. Next, we therefore believe that in each content area, teachers, and other scholars, should work to make the structures of the texts in the domain more visible to teachers and ultimately to students. We also believe that students should expect that their work, with text, will be an object of scrutiny from their teachers, their peers and others. In short, students should

expect to be asked not only whether they read but also how well they read. Finally, from the perspective of research, we need to be about the task of developing a vastly larger set of reading-to-learn strategies that can be made a part of discipline-based instruction and can be shown to improve both the development of reading-to-learn and content area knowledge.

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