"Lesson purpose" in its social and cultural context: video ethnographic evidence on the functioning of a highly rated curriculum unit in diverse middle school science classrooms

Joel Kuipers, Sharon Lynch, and Curtis Pyke

Abstract

This paper explores the use of video ethnographic data as a source of evidence for documenting how, and whether, "lesson purpose" is conveyed in highly rated science curriculum units. Although its importance is widely assumed by evaluators of instructional materials and practices (e.g. Project 2061), its social and cultural functions in demographically diverse classrooms are not well understood. Based on more than 2,500 pages of transcription and 120 hours of digital video from two different classrooms over the course of two years, this study examines "lesson purpose" as an interpretive act carried out by students and teachers collaboratively through processes of clarification, object manipulation and scientific term use. By demonstrating variations among students and between classrooms, the study outlines the features of a classroom ecology by which "lesson purpose" functions.

Introduction

In the demographically diverse suburbs of the Washington DC area, two classrooms struggle to find "the point" of the same science experiment in two different middle schools. In one, groups of students seated at tables of four argue amongst themselves about the results. After much debate, one student at one table prevails by arguing that his interpretation was correct because it accords with "the point" of the experiment. In the other classroom, the students debate with the teacher about the significance of the variation in results, but "the point" of the experiment was supplied by the teacher at the end.

Video ethnographic methods reveal that conveying lesson "purpose" in a classroom laboratory experiment requires the performance of a complex story. Guided by largely unstated narrative conventions, teachers and students must collaboratively construct the characters and components of the story, its complicating actions, climaxes, and evaluations. In addition, the stories that emerge from science experiments are ideally authoritative, reflecting the laws of nature and direct observation of the real world.

This poses special challenges for science curriculum design. Although actual classroom experiments rarely work as planned and when they do, the results are often confusing (Atkinson, 1977) to gain status as "highly rated" according to the criteria of the AAAS 2061 project, not only must a curriculum unit provide students with "direct experience of relevant phenomena" - usually through hands-on manipulation and experimentation, but also the curriculum must provide a systematic framework by which the teachers and students link these experiences up with the stated purpose of the lesson.

Objectives

This paper explores the use of video ethnographic data as a source of evidence for claiming how, and whether, "lesson purpose" is conveyed in highly rated science curriculum units. It compares video ethnographic data from a pilot study carried out in 2001-02 with replication data from the first year (2003) of a 5-year study. Both years examined how Chemistry That Applies (CTA), a highly rated science curriculum unit, functioned in demographically diverse middle school classrooms in suburban Washington DC. A comprehensive video record of the implementation of CTA in these classrooms, with particular focus on lab tables of four students, was compared both qualitatively and quantitatively. The ethnographic results are placed against the results of pre- and post-test assessments of the target concept and against motivation and engagement data for five pairs of schools in the same system. Preliminary results suggest that overall, African American and Latino students improved significantly in relation to the target concept, while Euro American and Asian American children improved slightly.

The goal of the paper is to explore the evaluative criteria #1 - "Conveying Lesson Purpose" - of the American Association for the Advancement of Science's 2061 Criteria for evaluating the quality of instructional support. The paper seeks to examine how the concept of lesson "purpose" functions in diverse classrooms. We carry out this investigation by contextualizing it; specifically, drawing from transcribed videotape data, we describe and compare how the same stated lesson purpose is interpreted by both students and teachers in two actual classrooms.
Perspectives

As a linguistic, historical and cultural construct, a curriculum - regardless of how highly rated it may be scientifically (Roseman, 2001) - cannot be separated from culture, language and its context of use (Lee, 2001). While currently the importance of a clearly stated "lesson purpose" is a central feature of curricular and pedagogical orthodoxy, (and indeed is required by law in some school districts), the ways in which this feature of communicative practice functions historically, cross culturally and contextually have not received much attention. Historically, "lesson purpose" was a construct of the teacher and perhaps the school system, not something that resided usually with the student. Cross culturally, communicative purpose in some societies is the prerogative of elites and high-ranking individuals; children and other lower-ranking individuals are expected the guess the intentions and purposes of their higher-status interlocutors, not vice-versa (Ochs, 1988).

While science education reform has claimed "science for all" as its primary goal, it is increasingly clear that "one size" does not fit all (Lynch, 2000). A set of teaching and learning strategies may work well in one environment but not another. "Best practices" may not be "best" under all circumstances, and particular classroom cultures may affect student outcomes. Unless attention is paid to the particulars of the context of learning in traditionally underachieving groups, standards-based reform efforts may ironically help to widen the achievement gaps between groups.

Methods

To explore how this highly rated curriculum unit actually functioned in classrooms characterized by high levels of student diversity, we videotaped individual classrooms 100% of the time as CTA was implemented, as well as three weeks prior to the implementation using a standard curriculum unit. One camera focused on a single lab table of four students of diverse ethnic backgrounds as they worked through CTA's lessons. Another camera focused successively on different tables each day as comparison with the treatment table. The data from each year were captured on 60 hours of tape that has been digitized, transcribed and coded using Atlasti software, yielding over 2500 pages of text.

For this paper, we focused on the performance of experiments and the ways in which the "purpose" of the experiment was explained, constructed by the students and integrated with the actual outcome. In particular, we focused on the shifting responsibility for the construction of a 'story' of the experiment. We examined ways in which empirical evidence, teacher input, and student discussions were weighted in the construction of a narrative outcome for the experiment.

In addition, as these stories were developed over the course of the experiment, we compared and examined communicative activities coded as clarification, scientific term use, and object manipulation. Clarification routines (consisting minimally of a "trouble" signal followed by a "remedy") were examined as a way of comparing the strategies of students for resolving confusions in interpreting the meaning of the lesson (Jefferson, 1988, Ochs, 1988) Use of scientific terms was examined as a way of determining the extent to which students identified with the goals of the lesson by adopting its specialized vocabulary. This was obtained by a search of the corpus of transcriptions on terms that corresponded to key terms highlighted in the unit, and these were sorted by speaker (Halliday, 1993). Object manipulation was examined as a way of determining the extent to which students made use of non-verbal, manual strategies for carrying out the lesson purpose, rather than verbal ones. Object manipulation was defined as manual engagement with lesson-relevant phenomena (Goodson, 1973). These three together were examined as evidence by which students signaled their interpretation of the lessons purpose, its manual consequences, and its technical features.

Results

Participants in the two classrooms explained "the point" of their experiments to themselves in different ways. In one, where the locus on interpretive responsibility lay primarily with the students, two of the students focused on interpreting the "teacher's intent" as the "purpose" of the experiment, especially when faced with ambiguous or potentially confusing results. Another student focused on interpreting the evidence from the emerging experiment and from other students' accounts of it in order to produce an account of the lesson purpose; another student, formerly ESOL and struggling with English, focused almost
exclusively on the lesson purpose as stated in the Curriculum Guide and its relation to the actual results derived from object manipulation. The first two students expressed their approach to the lesson purpose through frequent use of scientific terms, and frequent offers to remedy other students' conceptual and procedural "trouble."

In the other classroom, the teacher attempted to place the locus of interpretive responsibility with the classroom as a whole. While individual tables carried out experiments, these results were displayed to the whole class by the teacher, who solicited interpretations in an IRE framework of interaction (Mehan, 1979). One consequence of this approach was that the narrative linkage between the observed chemical changes and the "point" of the lesson was highlighted powerfully, while individual variation in interpretive strategies was minimized. Little discussion was devoted to the variations in the procedures by which these results were obtained. The point of the experiment lay with the teacher, and the students were expected to guess it.

Thus there were several ways of interpreting "lesson purpose" observed during the implementation of a highly rated curriculum, a curriculum unit designed to highlight the explicitness of this feature in instruction. One classroom - faithful to the curriculum - went back to the lesson's key question, and linked the answer to that lesson with the experimental data. However, students did not have interpretive control over this linkage process. Another classroom, allowed students more interpretive control, but they exhibited strong variations in their sense-making strategies - some focusing on the teacher's intent as a way of constructing "the point" of the lesson; others focusing on the variations amongst students at the table, and attempting to reconcile these variations with the "point" of the experiment (e.g. to show that "gas has weight"), and still another drawing on the authority of the written materials and the empirical results.

**Analytical Significance**

In the field of science education, studies that simply seek to add more and more statistical weight to documenting the achievement gaps between demographic groups have been criticized as "gap-gazing," arguing that we no longer need more studies documenting the gap, but more information on how the gap is produced and reproduced in the social and cultural contexts of American life. It is by now a well-accepted doctrine that culture and language cannot be separated from curricula, "content learning" or the classroom environment (Cazden, 1988, Heath, 1983, Lee, 2001, Roth and Lawless, 2002, Warren et al., 2001). As Erickson has observed, video ethnography is particularly useful in presenting the "how" of educational practice, not only the "what"(Erickson, 1985). It can provide in detail the procedures by which certain social realities of classroom behavior are constructed.

One such social reality is "lesson purpose," a feature of instruction whose existence and importance are widely assumed, if not clearly understood. By ethnographically documenting the variations in the process by which "lesson purpose" is actively interpreted by teachers and students, we can begin to identify its role in processes of learning for a wide variety of learners. If we can identify how lesson purpose functions in highly rated curriculum units for diverse learners, we should be able to move one step closer to a goal of achieving usable standards for instructional practice for all learners.

**REFERENCES**


