Visual Representations of Videotaped Interactions: Understanding Activity Patterns in the Classroom

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Abstract: This design-based research study investigates the development of pedagogical content knowledge (PCK) among nine teacher-participants in three design phases. PCK, central to teacher expertise, has been well documented over several decades. However, its actual development is difficult for researchers to investigate. This paper offers perspectives in the uses of video for design-based research on teacher professional development. The findings presented focus on video data and illustrate how teacher patterns of interactions changed from iteration 1 to iteration 2. A methodological strength is derived from an approach to coding teachers' actions and lays out a possible foundation for professional development models.

Introduction and Objectives

Video is an important tool for collecting data about complex learning environments and offers a unique perspective into the instructional moves and pedagogical patterns in which teachers engage (Sherin & van Es, 2005). Analysis of video is problematic, however, as it involves time-consuming transcription, and typically requires coding schemas that are drawn from ethnomethodologies (Koschmann et al., 2009). This poster paper outlines one case study that uses an approach to video analysis of classroom interactions that reveals the spectrum of pedagogical patterns occurring within any given class session. The main research question addressed within this paper is concerned with the relationship between teachers' activities in the classroom and their developing pedagogical content knowledge. The data presented is part of a larger, three-year design-based study that investigated teacher knowledge development through the interventions of scaffolded reflection and peer-exchange.

Inquiry Learning

Teacher actions within a classroom depend on the nature of their instruction. Lecture-based courses will obviously reveal a quite distinct pattern of interactions than small group collaborations, or other forms of inquiry-oriented instruction. Project-based learning is seen as one of the more accessible forms of inquiry (Krajcik & Blumenfeld, 2006) where teachers engage students in a well defined "project approach" that fosters student understanding of science ideas as they develop some artifact or event, typically in collaboration with peers. One interesting characteristic of project-based learning and inquiry learning in general is the student-teacher interactions that occur within a classroom during the enactment of any lesson. To better understand a teacher's enactment of his or her inquiry lesson, it would be of interest to capture such patterns and represent them visually for purposes of coding or comparison.

Video Capture of Classroom Activities

Video offers a way to capture actions and interactions within the classroom to serve as data for research studies of inquiry methods and to help researchers develop an understanding of the learning processes that occur. Given the iterative nature of design-based studies (Barab et al., 2006), video data becomes an important source of information to reveal the impact of design features and improvements between iterations. This poster paper describes an analysis, derived from previous work reported by Stuessy (2005), and illustrates its application of one teacher who planned, enacted, and revised a project-based lesson. Many hours of video data were captured for iteration 1 and 2 and an efficient analytic method was required to allow the determination of salient information about student-teacher interactions for each classroom session.

Methodology and Participant

This poster-paper presents a teacher case-study drawn from a larger iterative, design-based study where science teachers (*N*=9) design, enact, and revise a technology-enhanced, project-based lesson. This case-study highlights one teacher who has 11 years of expertise in teaching physics. Charlie (pseudonym name) co-designed his lesson with a mentor, a doctoral student with 17 years of teaching experience at the secondary science level.

Video Capture of Lesson Enactment

Video documentation (supported by field notes) was used to capture distinct types of actions: small group interactions (SGI) where the teacher interacted closely with small groups of students; large group interactions (LGI) where the teacher lectured the whole class; and isolated actions (Iso) where the teacher was working alone on grading or some other task during class time. Both SGI and LGI were subdivided into classroom

management (M), pedagogical (Ped) interactions, and logistical (Log) support (e.g., setting up the apparatus). That is, a teacher could have whole class, or small group interactions that were coded as M, Ped, or Log, depending on the audio and video content of the interaction.

Each class period, video data was segmented into four main parts (e.g., beginning of class, middle of class, etc.). Segment 1 was the beginning of the class. Then, according to the categories described above, a measure of the amounts of time spent in the various forms of interaction was taken. The video coding was limited to a supportive view of a teacher's patterns of interaction within their lesson enactment (e.g., How much time was spent at the front of the room?). Such questions can be addressed qualitatively through examining graphical representation of the percentage of class time spent on various forms of activity, adapting Stuessy's (2005) method of video segmentation.

While all teacher enactments of all lessons were videotaped. For present purposes, videotapes of only one teacher's classroom enactments are shown in order to illuminate patterns of practice in the classroom.

Analysis and Findings

Stuessy (2005) developed a methodology for representing the pedagogical characteristics of classroom instruction. She introduced an innovative graphical representation that displayed several important factors concerning both student and teacher activities. This allowed for a symbolic representation of the flow of activities, the emphasis on small group or whole class instruction, the activities engaged in by students, and the qualitative nature of student-teacher interactions. Such a video coding system was adapted in order to allow some insight into the student-teacher interactions that occur within the classroom. Project-based learning focused on student collaborations and interactions about physics, and therefore video followed specific patterns such as teachers engaging in small group interaction (SGI) for management or pedagogy helping content development, or large group interactions (LGI) for management or pedagogy, enabling a more complete understanding about teacher project-based processes within classrooms.

The following patterns of video segments compare Charlie's enactments (see Figures 1 and 2). Seen in second video enactment figure 2, there are changes in the level of small group interactions. In Day 4, Charlie incorporates more small group interactions, so that student groups begin to discuss and dialogue right away about the science topics. Charlie's change in practice to include more small group interactions was also representative of a conscious effort from Charlie to listen to students, and to provide students with as much time as possible to organize their understanding about the science concepts. The patterns of Day 1 influenced Charlie and were illustrated in the lesson plan revisions, reflections, and then the enactment patterns of Day 4.
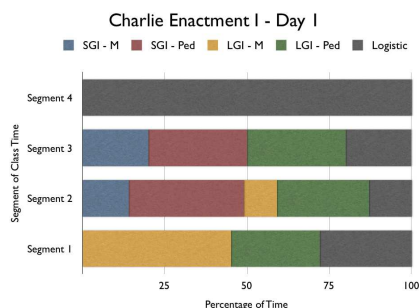

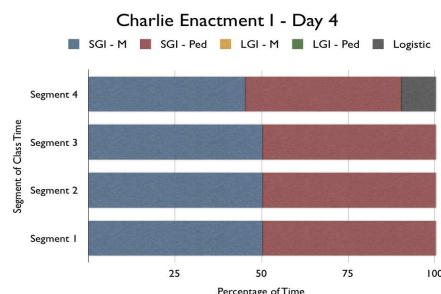Figure 1. Charlie's Video Enactment Day 1—Iteration 1.

Figure 2. Charlie's Video Enactment Day 4—Iteration 1.

Conclusions

Visual representation of the video capture helps researchers understand the types of interactions that occur within the classroom and provides insights into classroom practices. Teachers that were engaged in small group interactions had better quality lesson plan and reflected deeply about their practice. A visual representation about teacher enactment helped identify when and how teachers could adjust their interactions and practices.

References

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