Progression of one Student Group's Work

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Abstract

This paper discusses a case study of a student group working on a research project in a 5th grade science classroom. Over a 12-week unit of study, the group learned the content necessary to produce a research report on endangered species, and they learned to manage their own research activities. The study addresses how the teacher and student group organized the student work such that this happened. A 4-step progression in the organization of the student group's work is identified. A key part of the findings is that the group cycled three times through this progression of increasing student autonomy and expertise.

Introduction

When students are working in classrooms they are learning far more than the content material being taught – they are also learning who gets to do what with that content. Through ongoing classroom interaction the students and classroom teacher negotiate what work is to be done, what kinds of questions and information are relevant to doing it, and who gets to say how it goes. Traditionally, classrooms have been organized so that teachers define what is to be learned and then impart that knowledge to individual students, who either get it, or don't. In recent years educational reform has attempted to change how classrooms are organized, such that students become active and critical in their own learning, and teachers guide students toward productive engagement with the content using their own inquiry activities. This paper examines how a group of 5th grade students learned to do a research report in just such a reform-minded classroom.

This paper discusses a case study of a student group working on a research project in a 5th grade science classroom. Over a 12-week unit of study, the group learned the content necessary to produce a research report on endangered species, and they learned to manage their own research activities. The study addresses how the teacher and group organized the student work such that this happened. A key part of the findings is that the group cycled three times through a pattern of increasing autonomy and expertise over the 12 weeks, repeating the pattern each time they began a new activity in the research project.

It has long been held in the cognitive sciences that how information is presented impacts the representations people build. That is, we understand that there is a connection between the structure of information and the mental actions that learners take on it. Taking this idea beyond the actions of individual learners, situative research is concerned with informational structures as they develop and are used in interaction. For example, research has shown that how classrooms are organized has bearing on what kids learn to do with the content material (e.g., Boaler, 1997; Brown, 1992; Greeno & MMAP, 1998). One question emerging from this work is how the organization of the classroom gets negotiated by teachers and students.

In didactic classrooms, the lines of communication are more constrained, and the patterns of negotiation are both more constant and more readily detected (c.f., Mehan's (1979) seminal study on the didactic instruction pattern IRE). In classrooms organized around project work and group learning the interaction gets more complex very quickly, with the analysis becoming concomitantly complex.

Examining how classroom practices emerge and develop over time requires analysis in a very detailed manner, with attention given to how the work is organized and by whom, over extended periods of time (e.g., Cobb, Stephan, McClain, & Gravemeijer, 2001; Engle & Conant, 2002; Newman, Griffin, & Cole, 1987). This paper contributes to this line of work, by presenting a four-step progression of change in the organization of a student group's work. The steps are foregrounded here, and treated more fully in a later section:

1) initially the students were able to do very little content work and proceeded with whatever they could, while the teacher gave detailed instructions to the whole class;
2) shortly afterward the students began to follow the teacher's exact language, borrowing her words to order and organize their work;
3) next the student group began to work on ideas that were supported within the group itself, while the teacher shifted away from whole-class instruction;
4) later the group was elaborating its own ideas and working together, while the teacher checked in with the group and individual students.

Empirical Setting

The study examined the development of classroom practice in a 5th grade classroom during a 12-week research project on Endangered Species. The classroom was located in a San Francisco Bay Area school taking part in the Fostering a Community of Learners program. The FCL program was designed to promote literacy through science inquiry, and emphasized distributed expertise in the classroom, and developing students' abilities in sustained complex thinking (Brown & Campione, 1994). The classroom teacher involved in this study was an experienced teacher, teaching

this unit for the second time. The students had diverse SES and ethnic backgrounds, and the groups were of mixed sex and heterogeneous ability. The group discussed in this study was comprised of three boys and two girls. The data were collected as part of a larger study on the process of conceptual change in conversation (Greeno, Benke, Engle, Lachapelle, & Wiebe, 1998). The sample used here consists of videotapes and audiotapes of naturally occurring interaction over 40 class periods, ranging from 45 minutes to almost two hours.

The videotapes of the group were viewed, and detailed narrative annotations (cf., Rogoff, Mistry, Goncu, & Mosier, 1993, ch. 3) written for each day's videotape, in intervals of one to two minutes. These annotations focused on actions (e.g., pointing to picture and writing), verbal contributions (e.g., comments and questions), and attention of group members and the teacher to one another or the materials (e.g., looking, pointing, leaning in, and avoiding). Content-relevant conversations were closely transcribed. From these narrative annotations, analytic summaries were constructed for each class day. Patterns in the organization of student work began to emerge in the summaries, and were cross checked against both the annotations and the video record.

4-Step Progression of the Group's Learning

Observing the classroom studied here it was clear that the participation of the students and teacher changed significantly over the course of the unit. While this progression was continuous, is it analytically useful to segment it into a few discrete steps to better understand both what was changing, and how. To this end I identify four main steps to the organization of the student group's work, which reflect shifts in how the teacher and students together were organizing the student work to get done.

Step 1 - Initially, doing what they can with teacher introductions

On the first day of the unit, the group's work is best characterized as diligent but not exactly on target with what the teacher had instructed them to do. Throughout the day's activities, the students were enthusiastic and well behaved, already evidencing an inclination to take an active part in their own learning. This kind of active participation is a key goal articulated in education reform, but taken alone it does not constitute or ensure fruitful learning; rather it is seen in this progression as an important and necessary precursor to the kinds of expertise and autonomy the group came to develop. At this initial step, closer inspection of what the student group were working on reveals that their diligence didn't guarantee they were doing what was requested. Instead, we find that the group's work was closely related to the teacher's instructions, but missed the target on some rather key points. Hence, this first step is characterized by a genuine intent to work, with the group doing whatever they could with what the teacher told them. Importantly, the students seemed unaware of, or at least unconcerned by, the degree to which their work was misaligned with the teacher's instructions.

Step 2 - Early work, using the teacher's words, mostly from teacher introductions

The first shift in the group's work came as the students started to attend more precisely to what the teacher was telling them. As the teacher continued to give lengthy and detailed introductions to the whole class at the start of the lesson, the students began to shape both their actions and their word choices using her exact words. The content of the unit was emerging and becoming better defined during this time, but the students' contact with it can be characterized as handling the terms as if they were placeholders or captions more than complex domains. While the group continued to be enthusiastic and appeared very intent on getting down to work, the ideas they pursued were taken directly from the teacher's language. They began to talk about what they are "supposed" to be doing, and the group began paying some attention to whether that was happening. That is, at this early step the students indeed were actively participating in their own learning, but the teacher remained the guiding force for the organization of their work.

Step 3 - Middle, beginning to work on group ideas, while teacher guides the group

The next shift in the group's work is marked when they began to voice ideas of their own and began to pursue those ideas which got support from others in the group. The group began to develop a sense of their research topics as domains, rather than captions, and began to treat the information entailed by the topics. The group's talk about what they were supposed to do disappeared, replaced by assertions of what to do which nonetheless looked for support from within the group. The teacher's guidance also shifted in this step, to shorter whole-class introductions and more checking in with the group. Furthermore, her interventions became highly dependent on the group itself, and we can see in her interventions choices she was making to help the group see itself as responsible for its work.

Step 4 - Later work, elaborating ideas and working together, while teacher checks in

The final shift in the group's work is marked by the students acting with more authority on their own ideas, more fully elaborating those ideas, and looking even less than before to the teacher for input. In this final step of the progression the teacher had shifted away fully from giving instructions through whole class introductions, to checking in with the group and individual students in order to monitor their work. The idea of being done began to emerge in the group's talk, and the group began to pay some attention to the criteria for deciding whether they were finished with their work.

Steps 1-4 again (and again) – cycles of progression

What is perhaps most significant about this progression is that it occurred not once, but three times over the course of the unit. The research project was structured by the teacher into three principal activities, Gathering Information, Outlining, and Writing. Each activity led to the next. As the teacher determined that the groups were ready to move on, she had the class finish that activity and start the next one.

My analysis was conducted by viewing the videotapes of each class day in chronological order. As such, the student group's work in the first of the research project activities (Gathering Information) was analyzed first. A general trend emerged in the group's work: the students could be seen moving from doing what little they could with the content to taking on more responsibility for their work and connecting that work more closely to the content. Surprisingly (to me), when the class started work on the second activity of the research project (Outlining), the organization of the group's work shifted dramatically, looking much like they had when the unit had begun. Analysis of the second and then third research project activities found that each time the group shifted to a new activity, they restarted the progression, following again the whole path taken toward more expert and autonomous work.

Analysis

This paper presents a 4-step progression from direct guidance to student autonomy and expertise. In this section I present two episodes from the corpus of videotape data. The analysis of these episodes uses a three-level analytic framework to examine how the teacher and students were organizing what the students were working on (Wiebe, in press). The three levels are Global (the pedagogy and learning trajectory), Task (the classroom work), and Local (the moment-to-moment interaction). While these are not the only possible levels for viewing classroom interaction, I believe they are particularly useful ones. These three levels were chosen because a) the different views they offer have ecological validity for the classroom activity setting – teachers must plan what they want students to learn, students must get work done, and negotiation about that work must happen; and b) they offer usefully different scopes and time scales over the interaction. Combining the information made available by viewing the interaction from each of these levels gives us a better understanding of how the interaction developed, and the ability to construct a more complete model of the learning.

The episodes are drawn from the middle of the group's first cycle through the 4-step progression, when the group was engaged in Gathering Information. The episodes illustrate the organization of the group's work at Step 2 and Step 3 of the progression.

Episode 1– "Sorting questions"

This example illustrates the group's activity at Step 2 of the 4-step progression. In this episode of interaction the group was sorting questions about animals into piles that addressed what animals need to survive. The interaction typifies activity at Step 2 – the student group was organizing its work using the teacher's exact words, taken mostly from the whole-class introductions the teacher used to orient the students.

Context for the Episode – Early in the unit (Day 2) the teacher had students sort questions they had generated, as a step toward developing a set of survival adaptations that would fit all animals. This set would then become the specialty topics students researched for the unit. In her introduction to the class, the teacher brought in the main idea (of what animals need to survive), gave a very explicit set of instructions about carrying out the task (they will get envelopes, all the questions, scissors, and will make piles), and then reemphasized the point of the categories (piles that help you think about how animals survive). The students organized their work attending first to her set of instructions, taking them very literally. Upon receiving their pages of questions, the group proceeded to cut them, and chat about cutting, without addressing any of the content of the questions themselves. Only when they had finished the cutting part, did they broach the text of the questions and the task of sorting. Once their attention was turned to that, the categories they chose were lifted heavily from the teacher's introduction, including terms she had explicitly ruled out.

Looking at this set of events at three different levels reveals different aspects of the nature and the structure of the interaction. Below I examine the interaction from the Global (pedagogy and learning trajectory), Task (classroom work), and Local (moment-to-moment) levels, using each to illustrate how the teacher and students together were organizing the student work.

Global – The teacher's interest in the lesson was for the students to begin to develop ideas about what animals need. The categories the student groups generated were to be used in a whole-class discussion, in which common categories could be highlighted and pertinent terms could be introduced using the students' ideas and language as a starting point. Having the students generate the questions and categories meant that going in to the whole-class discussion the students had already had some time to be working with the content of the unit. In this way, the teacher was creating places for the students to explore and become invested in the content, even as she set the agenda and guided the discussion toward a desired set of terms (the set of survival adaptations). The students enthusiastically brought themselves into contact with the content, but with little understanding of the material, their main point of entry was the teacher's own language. Hence they made use of what was available to them, and in doing so advanced their own position relative to both the content and their ability to carry out their research.

Task – The teacher's introduction to the task initially focused on the point of the task and the conceptual space the students would be working in. Her interest was in having the kids generate categories, and cutting the questions was just a step to get them there. It behooved her to be specific about the less important precursor steps, helping all the kids to power through that in an agreed upon way, but note that she did not give the same kind of explicit instructions for the students for developing their categories. This is the way in which the structure of the task created spaces for the students to be developing their expertise and autonomy. The category ideas were theirs to create, with the teacher guiding and shaping them. How they did it was also theirs to negotiate, with some reference points provided by her, but with the work itself up to them. What is interesting is to look at how the students organized themselves within this space afforded them. They latched on to her specific instructions and used those as their starting point, with no contact with the conceptual point of the task. Only once they had completed the highly specified work did they turn to the, presumably, harder work of devising categories. At this point, too, we see that their work was organized by the teacher's language. The ideas they had for their piles came from her introduction. When she came to check in, new words that she used immediately got worked into the group's discussion. When it was their turn to contribute to the whole-class discussion, the categories they offered were ones that the teacher had expressly commented on.

Local – As they turned to the work of sorting, the group began by calling out categories: Swiss Army bird, all about birds, volcanoes, communication, and Oh Oh birds. Interestingly, three of the categories were about birds (two about specific kinds of birds), despite the fact that in the teacher's introduction she said: "if you took the same approach we did with Borneo you might have a pile for the Oh-oh birds, and a pile for the carnivorous caterpillar. We're NOT going to do that." That is, one of the earliest categories the group chose had been ruled out explicitly by the teacher in her introduction. The students also called for a category on carnivorous caterpillars, invoking the other category the teacher ruled out in her introduction. Later in the lesson when the teacher came over to check on their progress she tried to make clear that their categories should not be about single animals explaining, "Okay, instead of having questions about a bird category, and a-" but she was interrupted. One group member (Ron) seemed to have an idea of what the teacher was suggesting, but he had difficulty persuading the group. When the teacher addressed them again, she specified, "Okay guys, listen. (2s) We don't want all flamingo questions= (Ron: =Exactly what I'm saying!=) We don't want all bird questions." They discussed it more, and the group did begin to work with some of the terms she had endorsed, but their misaligned ideas also persisted, including carnivorous caterpillars, Swiss Army birds, and Oh Oh birds. Gradually, most of the bird questions were moved into other piles, but other ill-fitting terms which the teacher had not explicitly addressed remained in use (e.g., Hawaii, volcanoes). That is, we see that the ideas which got put forward and were taken up derived largely from the teacher. New ideas developed within the group didn't appear until later in the unit, and then slowly.

Using the three-level analytic framework we can see (with Global level view) that the students were enthusiastic but relatively unconnected to the content; (with Task level view) that the tasks were highly structured and yet the students navigated them within that structure; and (with Local level view) that the students shaped their work according to the teacher's words. At each of these levels we find that the activity is best characterized as Step 2.

Episode 2 – "Choosing a research specialty"

This example illustrates the group's activity at Step 3 of the 4-step progression. In this episode the group members were choosing their survival adaptation topic to research for the unit. The interaction typifies activity at Step 3 – the student group was organizing its work by beginning to work on ideas developed within the group, rather than simply using the teacher's words, and there was less emphasis from the teacher on giving instructions and more on being available for guidance.

Context for the Episode – Within the research groups each group member specialized in one or two survival needs of animals (e.g., Food Getting, Reproduction) and was responsible for writing that chapter of the groups' research report. In a series of whole-class discussions, a class list of topics (the survival adaptations) was generated. In this episode (Day 10), the teacher said in her introduction to the class that the groups needed to be working on who was doing which topic. The group moved to make their choices without explicit discussion of how to divide the topics, and approached the choice in different ways. By the end of the lesson the choices had been made. In this 14-minute episode, the group members started calling out their choices, and one student found there was nothing left that she liked. Her attempts to open up the selection process resulted in some productive group conversation about the topics and the beginning of talk about what they entail.

Below I examine the interaction from the Global (pedagogy and learning trajectory), Task (classroom work), and Local (moment-to-moment) views, using each to illustrate how the teacher and students together were organizing the student work.

Global – In her introduction to the class at the start of the lesson, the teacher indicated to the students that they needed to be working on who was doing what topics, but did not give directions as to how to accomplish that. Given how central the idea of each child doing a research specialty was to the content of the unit, it is conceivable that the teacher would have wanted to guide their choices somewhat. At the same time, however, it was also central to the learning

trajectory of the unit that students develop a sense of being responsible for conducting their research. In this instance the teacher made clear what the task was, but in contrast to the previous example, she did not structure how it should get done. Instead, she left the door open for the students to figure out how they would divide the topics, and by creating this opportunity for them to act on their own initiative, the teacher helped the students develop the sense of ownership that was central to her learning goals. This pedagogical choice was productive in two ways: the students took up the opportunity and proceeded in their own way, taking some ownership over their work. In doing so they also stepped into fruitful conceptual terrain.

Task – At the beginning of the episode, the group was returning to the classroom and getting settled in to work. They were not yet clearly working toward any specific goal, and were having only light contact with the content (looking at their books; talking about eagles' wingspan) when one of the researchers asked if they knew who was doing which survival adaptation. This spurred them into a process of choosing, which resulted in various kinds of work on the content of the unit. They clarified the terms being used (survival adaptations refers to the categories on a class list); reminded themselves of the specifics of those topics (some of the group's earlier categories didn't make the class list); and became clear about where terms referred to the same topic (two people wanted the same content: prey, food getting, and hunting). Members of the group approached choosing their topics differently and there was no explicit consideration within the group as to how the choice should be made: it was accepted that as people called out the topic they wanted, they could lay claim to it. Despite the absence of a conversation about how to choose the topics, the process of choosing took them into a productive discussion of the topics themselves. Even so, there were limits to how much they could negotiate on their own, and as their conversation required additional support one of the students called in the teacher - not to adjudicate the process of selecting the topics, but rather to clarify the deeper content issues that choosing had invoked.

Local – We can see a shift in how the group was working when one student (Sunny) wanted a topic another student (Monay) had picked. Monay staked her claim over the topic and made it clear that food getting was already hers. She then directed her attention to the other group members, excluding Sunny. Despite being turned away from, Sunny persisted and asked Monay about another topic, communication, and Monay took up helping Sunny find a new topic. In the course of trying to help/persuade Sunny, Monay and the other members of the group ended up talking about what some of the topics actually entailed. Their interaction shifted from simply calling out the topics as if they were titles or headlines, to starting to consider what the topics meant and what it would take to research them. Helping Sunny choose her topic the group members touched on

- communication and whether bald eagles do it:
  Sunny: "I don't think the eagles do communication."
  Andy: "Yes they do. I think they do. They make lots of noises. And we don't really know why."
- migration as where eagles travel.
  Monay (to Sunny): "You could do where they travel." She looks at the board, and points. "Migration." then points to a whole page on it.
- and reproduction as taking care of babies
  Monay: "Here. You can do **baby** eagles" and holds a book up for Sunny to see. Jay looks over too.
  Teacher comes over to observe the group without speaking.
  Monay flipping through the book, again says "Reproduction."
  Sunny : "Hmmm."

Through their conversation the group members both opened up the conceptual ground they were working with, and began to validate and work with some of their own ideas. Even so, after awhile Sunny turned to the teacher for assistance, drawing her into their conversation by asking her a question about what the group had just been working on:

Sunny (to the teacher): "What's reproduction again?"
Monay responds: "Reproduction is like when they have babies, and things."
Teacher: "Reproduction can be a couple of things" as she walks around sits in Andy's empty seat. "I mean reproduction can be a giant, giant topic" looking at Sunny and Monay.

Invited by the group to shift from quiet observer to conversational partner, the teacher follows up with some clarification of reproduction as well as some record keeping as to who is taking which research specialty. In this way the group had some time to be working on ideas they developed, followed by some guidance from the teacher, positioning them to act further on their own, now more elaborated, ideas.

Using the three-level analytic framework we can see (with Global level view) that the students continued to pursue their work with enthusiasm and initiative, but that in comparison to the previous step, here their work was more closely connected to the content and it was beginning to be developed within the group. We can also see (with Task level view) that the tasks on which the students were working were less structured by the teacher and afforded more opportunity for the students to develop their ideas while carrying out the work. Finally (with Local level view), we see that the group's negotiations of the content and the task reflected and also deepened their growing understanding of the material and their ability to navigate their own path through it. At each of these levels we find that the students' activity is best characterized as Step 3.

Discussion

This paper introduced a four-step progression in the organization of a student group's work as they conducted a research project on endangered species. Using a three-part analytic framework, I illustrated how the teacher and students together brought about the change in the group's participation in the classroom, such that the group became more autonomous and more expert in their work. The progression was seen not once, but three times across the unit of study, reappearing in full each time the group started a new activity within the research project.

At a pragmatic level, the description of the progression of the group's learning may have utility for thinking about classroom design and teaching, especially in light of the persistence of the progression across research project activities. Clearly learning to work together well with the content once was not enough. Rather, each time a new activity began, the group retraced its steps — yet each retracing proceeded faster than the previous one, suggesting that the group was learning more robustly across time.

At another level, the study offers a case for thinking about the Vygotskian notion of a Zone of Proximal Development (Vygotsky, 1978, 1986) as pertaining to more than one learner at a time. Vygotskian theory has been seen as pushing the study of cognition out of the heads of individuals to a more contextualized take on cognition as it occurs in social context (e.g., Greeno & MMAP, 1998; Lave & Wenger, 1991; Rogoff, 1990). This study contributes to that trend by suggesting that cognition and learning can fruitfully be investigated as pertaining to a group of individuals working together.

At a third level this paper tackles a more theoretical problem. In demonstrating that close analysis of interaction can reveal the development over time of particular classroom practices (in this case, the development of a research practice by a student group) I join other situative theorists in an effort to shift the conversation about learning. At its core, this paper puts forward the argument that the construction of a classroom practice *is* the learning which takes place in that classroom, and that it is jointly accomplished by the teacher and students through the ongoing organization of student work.

While these ideas are not new to the field of cognitive science, neither have they been the mainstay. It is hoped that the paper offers a discussion point for those interested in the contextual elements of cognition on how we can focus our looking at interaction, as well as an example of what we will see when we look there.

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