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# Intellectual Role Taking: Supporting Discussion in Heterogeneous Elementary Science Classes

*One of the major challenges of teaching whole class lessons in heterogeneous classrooms rests in finding ways to engage all participants in the conversation. Intellectual role taking, an approach developed and studied in the teaching of elementary science and history lessons, provides one possibility for handling this perennial pedagogical dilemma. Intellectual role taking builds on 2 well-known and well-studied pedagogical approaches—complex instruction (Cohen, 1984, 1994) and reciprocal teaching (RT; Palincsar & Brown, 1984). Complex instruction provided a foundation for small group work time and RT informed the development of intellectual roles to be used during small group time and whole class discussions. This article provides a detailed description of the approach, highlighting the school con-*

*texts and research literatures that informed its development. Examples from elementary science lessons are included and suggestions for using it in elementary history lessons are discussed.*

**I**N 1992, I HAD A CHANCE to work with teachers in a new urban science and technology magnet school as they implemented complex instruction (Cohen, 1984, 1994) as the centerpiece of their science program. During this time, I observed and interviewed teachers, documented students' learning, and videorecorded professional development workshops that introduced key ideas from complex instruction, including valuing multiple abilities and becoming aware of and treating status differences in the classroom. Teachers found most aspects of complex instruction demanding but over time began to feel successful with their efforts to increase equity and access for all students, especially during small group work time. However, teachers struggled with science content and concepts and the *reporting out* time of each lesson

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when students had an opportunity to present findings from their small group investigations. Teachers reported that students were not paying close attention to the reports of their classmates. As time went on in the unit, teachers said that reporting sessions became shorter and shorter, not more elaborated and complex as they had hoped. Teachers also noted that it was difficult to get students to ask questions of one another during this reporting time. So, although cooperation during small group work was taking place, collaboration at the level of constructing and discussing scientific ideas together as a whole class was not happening spontaneously in the classrooms.

My own observations in classrooms corroborated teacher reports. I noticed that the discussion during reporting was almost exclusively between the teacher and a reporter. This worked well to accomplish some goals, such as giving specific feedback to individual students or small groups, but it frequently meant that the audience went on snooze control, to borrow the words of the science facilitator at the school. The teachers tried strategies to get the students involved in asking questions of one another but felt that this was a struggle. When students did ask questions, they often seemed peripheral rather than central to the intellectual ideas under investigation. It was clear to me from this experience that changing students' implicit assumptions about who was responsible for asking questions in classrooms was complicated. How could I try to work with teachers to develop approaches to engage all students in asking each other questions and deeply engaging relevant conceptual ideas?

In the following sections, I describe intellectual role taking, the approach I developed and studied in collaboration with teachers to address this important concern. Giving students a cooperative learning experience where all students' input was valued regardless of social status, linguistic background, or abilities in the traditional subject areas of reading and mathematics was an important step to ensuring access and equity for all students. However, whole class discussions provide a powerful place to harness heterogeneity of experience, ideas, and understandings. It is also a key place

where the teacher can have a voice in shaping the kind of intellectual climate that develops around sharing and vetting ideas in science. Without these kinds of experiences, students are left to shoulder the burden of evaluating and synthesizing science content alone or in small groups. Fully embracing heterogeneous grouping requires careful consideration of how to support these crucial intellectual dimensions of working together.

### **Intellectual Role Taking**

There are three kinds of role taking that are used in this approach. However, even before role taking is considered, it is necessary to think about the kinds of cognitive work we expect students to do during small group time as well as whole class time. The foundation of intellectual role taking is the identification of practices that characterize thinking within a discipline. These practices should be used to provide students with explicit guidance for developing good "habits of mind" (Rutherford & Ahlgren, 1990, p. 171; see also Cobb & Yackel, 1996). For instance, in science, I highlighted three important thinking practices: (a) predicting and theorizing, (b) summarizing results, and (c) relating predictions and theories to results. These practices were targeted because children as well as adults struggle to coordinate theories and evidence, a crucial element of complex scientific thinking (Chinn & Brewer, 1993; Duschl, 1990; Kuhn, 1992, 1993). This is clearly an idealized version of a particular kind of experimental scientific thinking. As such, it serves as an early introduction and guide for young students. Other forms of scientific investigation might involve other focal intellectual practices. These practices should be chosen carefully because they serve as the foundation for all three forms of role taking: procedural roles, communicative roles, and intellectual audience roles.

Procedural role taking occurs in small group work settings. As a feature of complex instruction (Cohen, 1994), procedural roles are designed to provide all children access to materials and ideas, regardless of their social status in the

classroom. They distribute procedural tasks such as getting materials, cleaning up, recording the group's work, and facilitating the group's movement through an activity. The roles shift daily so that each student has an opportunity to carry out different tasks. These roles are important for young students as they help ensure equity, minimize disputes and disagreements, and help students see their own and others' budding competencies. When groups function well on a procedural level, it also makes transitions to intellectual activities more fluid. During small group work time, the students used the *procedural roles* (materials manager, facilitator, clean-up manager, recorder). This procedural guidance was combined with the foundational practices of *thinking like a scientist* to support students intellectually as they progressed through an investigation in their small groups.

The next set of roles, *communicative roles*, is used during preparation for reporting sessions. Reporting, often used as a procedural role, is quite a difficult task for students to take on individually. Therefore, within this model, two students in each small group act as reporters and two students act as scribes who help prepare the materials that the reporters will use to talk about their group's work to the entire class. The students once again focus on the practices of thinking like a scientist as a way to structure their reports and provide information that will be helpful to the audience. These roles also rotate to ensure equity and give all students an opportunity to function as reporters and scribes for their group.

The third set of roles, *intellectual audience roles*, is used during whole class reporting sessions. Intellectual audience role taking builds on the work of reciprocal teaching (RT; Palincsar & Brown, 1984). RT was designed to support readers who were able to decode but struggled to comprehend. To help these students, a set of roles was designed for them to use while reading in groups. These roles exteriorized important metacognitive processes that expert comprehenders typically use including predicting, questioning, summarizing, and clarifying. These RT roles, although cognitive in foundation, are also highly social as they re-

quired students to take turns leading the group in the use of these thinking practices.

In intellectual audience role taking, we also wanted the cognitive foundation to come together with the goal of involving all students in deep discussion of the scientific ideas. To accomplish this we used the thinking practices of scientists and transformed these into audience roles. Therefore, students were assigned the responsibility to check reporters' presentations of predictions and theories, summaries of results, and relations among predictions, theories, and results during reporting-out sessions. This is a unique aspect of the model, developed in response to teacher feedback that spontaneous discussion of ideas was not occurring during reporting time. These roles rotated daily and provided students with a particular social and intellectual framework to begin the process of asking reporters questions. As the students began using these specific intellectual audience roles during science reports, they also navigated new social roles including questioner, commentator, and critic. As a result, when using their new intellectual audience roles, students had to learn to be gracious in accepting constructive criticism and had to present questions and deliver critiques in a manner that supported rather than attacked other students.

In this model, we develop a chart of questions with the students as they begin to take on intellectual audience roles and struggle to decide what questions to ask other students. Students are asked to think about the types of questions they could ask if their job was to check predictions and theories, summaries of results, or relations between these important elements of thinking like scientists. The chart is posted in a prominent place during reporting time and often serves as a scaffold for students as they begin taking on intellectual audience roles. As the students become more proficient at asking questions of one another and they develop more sophisticated disciplinary-based reasoning, they often become critical of the questions on the chart and ask to revise them (as later examples demonstrate). In taking on intellectual audience roles, the students assume responsibility for a good portion of the intellectual work that had previously been accomplished by the teacher.

## **An Example**

So, what happens when we put this model of role taking into the classroom? A complete response to this question is complex and beyond the scope of this article (see also Cornelius & Herrenkohl, 2004; Herrenkohl & Guerra, 1998; Herrenkohl & Wertsch, 1999). Here I provide excerpts of discussions from the fifth-grade class<sup>1</sup> to demonstrate how these roles were taken up and tried on by the students. The early phases of introducing intellectual audience roles in most classes proved to be socially challenging. In some cases students struggled to ask questions of reporters. In other cases reporters struggled to accept questions from their classmates without becoming defensive. It was evident that we had changed the rules of school as usual and the students clearly noticed. Although this was a passing phase and most students in all classes where these roles were used did come to find ways to ask and accept questions, it is crucial to understand that getting to that point often takes time and patience for everyone in the classroom. With time, we found that many, if not most, students in classrooms joined the conversation. In the fifth-grade class reported about here, student participation in reporting was between 68% and 79% for each session (see Kawasaki, Herrenkohl, & Yeary, 2004, for data on another class).

In the following examples, I chronicle the progression we noticed in a fifth-grade class as they adopted the intellectual audience roles in the context of a unit on sinking and floating. In this case, the role taking went from an unreflective game with repetitive questioning routines and a lot of laughter, to critique of questions as they were written on the chart, and finally to asking personally relevant questions and expecting thoughtful answers. Let us follow as this unfolds, beginning on Day 5, the first day audience roles were introduced. In this classroom excerpt, Aaron and Leah were reporting for their group.

Karita: Do you think your results make sense?

Aaron: Somebody already asked that. I said yes.

Karita: You did? Oh. What were the main things that happened in your results? [laughter from the au-

ience as Karita is obviously reading questions off the chart. Her reading is deliberate. Her tone and delivery make the students laugh.]

Aaron: Somebody already asked that.

Karita: Does the team agree with the results? [laughter from the audience] They didn't ask that one.

Students: Yeah, they did!

Teacher: Remember the rule? If you're called on, you talk.

Karita: What were the results you found?

Aaron: We said that at the beginning. [laughing and clapping from the audience] JP.

JP: Forget it man, see all this laughing made me forget it.

Aaron: Okay.

Teacher: Remember I told you there might be other questions you want to ask that aren't on the chart. Are there other questions you want to ask that aren't on the chart?

By the time Karita had this turn, the teacher reported that she was "utterly exasperated"<sup>2</sup> with her students. The teacher felt that asking questions "became a game for the audience members." That is clearly the way it looked. The children giggled and had fun but did not seem to be doing anything intellectually productive. As the teacher and I debriefed together, I shared my perspective on what had just happened. I was not surprised, nor was I concerned about what I was seeing. Like the children, I was enjoying the playfulness they brought to their interactions. Their behavior seemed natural, somewhat predictable, and their enthusiasm, given teachers' reports of lack of engagement, was certainly desirable! We had changed the rules. They had little or no experience asking questions of one another, so they were trying on this new hat and reveling in the way it made them feel. The teacher reported that she was relieved to hear this interpretation. As we worked to accept the students' enthusiasm, the teacher and I also agreed together to channel this exuberance by giving several types of feedback. We asked students to think about why they were asking questions. We pointed out that students should ask questions to which they wanted answers. We also suggested that they work hard to listen to reporters' re-

sponses and ask questions based on those responses. The following exchange on Day 8 demonstrates how the students began to take up these ideas. Here Toneisha interrupts at the end of a question session to indicate she wants to ask one more question of the reporters (JP and Ping; Dineta is a group member):

Toneisha: Can I have some more questions?

Teacher: Excuse me, there should be no talking as we change groups. One more question.

Toneisha: I don't get your theory.

JP: Our theory is that whether an object will sink or float depends on its density compared to the density of the object, or the substance that it's being placed in.

Dineta: It's like Sung said. It has holes that the air can go through the holes, like wood, you know,

Teacher: Uh huh.

Dineta: Then it will float. But see, like metal, it's all closed up and it's heavy so it's going to sink. But I don't know how to explain it.

JP: It's kind of like we can take in air and we can float in water. Air is what makes, air bubbles, they make you, when something is heavy, like in the 7-Up that we tested, something was heavy, it sunk, then the air bubbles surrounded it and it floated, it's kind of like that.

Toneisha: Oh, okay.

Teacher: That help you out? Okay, good. All right, do you see your theory up here [on the theory chart]?

There were several interesting features in this interaction. First, Toneisha, after the teacher had thanked the reporters, stopped the whole class from moving along to ask her pressing question. In this case, the question itself was a highly personalized statement, "I don't get your theory." However, the reporters clearly understood the implied question in Toneisha's statement. She did not get their theory so they needed to try and explain it again. JP and Dineta worked together to do just this. In the process, they referred back to Sung, who presented ideas they considered similar to their own. This interaction marked a significant departure from the first days where question asking was funny and responses were largely ignored. Here students asked personally relevant questions

and responses were connected to other ideas generated earlier in the reporting session. Another Day 8 interaction marked new recognition of the role of questions that appeared on the questions chart as well.

Toneisha: Shamone.

Shamone: Okay, did everybody agree with the results and your object predictions and theory?

Lynn: With our predictions, no, everyone had pretty much different predictions.

Shamone: Okay.

Lynn: I don't know about results. I think, I don't know what happened to results. And everyone agreed on our theory.

Toneisha: Dineta.

Dineta: Some people keep on asking why do everybody agree on the results. They should agree on the results, they was there watching! So how could everybody be [interrupts herself] why do you ask that?

Teacher: Yeah, I think that's a very good point. That there isn't a question about results—you see what happens—there shouldn't be [disagreement about results]. I agree with what Dineta's saying, that everyone should agree on results because everyone's there to see what happened. So perhaps that's a question we should strike from our list [questions chart] up there. So you might want to think about whether the question you're asking makes sense. Good point.

In this exchange, Dineta questioned why some people were asking questions about agreeing on results—a question that appeared prominently on their chart under the summarizing results section. After several days of working together on the activities, she argued that if everyone was watching when the objects were placed in the water, they should all agree on whether an object sank or floated. The teacher supported her and agreed that maybe they should strike that question from the questions chart. Dineta made two important moves here. The first was recognizing and reinforcing the idea that one should understand why she was asking questions. If the questions themselves do not make sense, then they should not be asked. The second is that she was the first student to point out the flaws in the questions chart. Here

she used the chart not as a set of marching orders, but rather as a thinking device (Lotman, 1988) to critically revisit and revise. In this way, the audience roles were opportunities for flexibility and improvisation rather than rigid requirements that needed to be fulfilled.

This conversation, together with several other key events involving the evaluation of theories that had been proposed to date, seemed to have a powerful effect on the students. Over the next few days, the questions chart seemed to go through a phasing-out experience. After Day 11, it was not mentioned explicitly again. We also noted that, although we kept the chart posted, audience members rarely glanced up at it for help as they had done often during the first days of the unit. In the span of six instructional sessions, this class moved from what looked like giggling with little significant intellectual work to substantial and important questioning of one another.

I end with a segment of talk that occurred on the last day of the unit. In this excerpt we see just how far these students moved in their questioning of one another. Here the students engaged in a powerful debate about the role of arguing in science (see also Herrenkohl, Palincsar, DeWater, & Kawasaki, 1999). The students had spent this last day debating the merits of several theories when they found themselves embroiled in a heated argument. At this point their focus shifted spontaneously from the content of the arguments and proposed experiments to the merits of arguing in science. Their discussion took on a distinctly philosophical and epistemological tone.

Sung: I say that arguing is a part of science, kind of, I know I'm wrong, but I mean because if you don't argue that, you can't find answers to stuff.

Students: [clapping]

Dennis: Okay, okay, can I saying somethin' Lynn? [Lynn is the reporter leading the discussion.] Well, if you argue where will it get you? You won't get nowhere.

Sung: Okay, Dennis, your argument is where would we get? We'd get to the truth.

Students: [shouting]

Karita: I agree.

Toneisha: Anyway, Sung, you say that the object is you [inaudible word] by arguin'? You guys don't have to be so loud. I'm not saying that you guys can't argue, I'm just saying you guys don't have to be that loud.

Sung: What's the point of arguing if you can't scream and yell?

Karita: I know, thank you.

Dennis: I have something to say in response to that.

Karita: Yeah, I agree.

Dennis: All right, if you're arguing, right? One person says something, you have another person say something, you have another person say something, how can you get to the truth when everybody's saying something? You can't even hear yourself think.

Here students raise questions about the merits of arguing for advancing scientific understanding. Clearly, their definition of argument (i.e., disagreeing with yelling and screaming) significantly differs from the one most scientists would espouse. However, Sung's point about the role of argument in finding the truth is a crucial matter for philosophers of science. Also, Dennis's suggestion that it is hard to get to the truth when everyone keeps saying something different is profound. These fifth-grade students started a unit on sinking and floating by playing with power and ended the unit as powerful players who were able to reflect together on developing questions about theories they themselves had generated.

### **Application to History**

Intellectual role taking, as I hope the preceding excerpts illustrate, is meant to be a scaffold and not a straightjacket. It can be adapted to fit the specific needs of particular students—from elementary school to graduate school. Furthermore, the students themselves can be in a position to revise and discard aspects of the scaffold that they deem no longer of use. It can also be adapted to function in any discipline. I have used these roles in the context of history as well as science lessons. In adapting the roles for history lessons it was necessary to identify the ways of thinking like a historian that were most important for the purpose of

the study. The three thinking practices we were the following:

1. Sourcing—Understanding the nature of an historical artifact. Asking questions such as these: Who wrote this? When and why? Is this a trustworthy source of information? What perspective is adopted? How believable is it?
2. Cross-checking—How do different historical artifacts compare? What are the points of agreement and disagreement? Are there any consistent patterns of agreement among a collection of artifacts?
3. Imagining the setting—What were prevailing patterns of belief and thought that are relevant to consider? How does the relevant historical context compare and contrast with the current time period?

These three areas then became the intellectual focus of small group work time and whole class discussions. Audience members were assigned roles that corresponded to one of the three practices of thinking like a historian. Other colleagues have used this approach in professional development with mathematics teachers where roles were built around practices such as justification, proof, and representation (Kazemi & Franke, 2004).

### Conclusions and Caveats

Like all educational approaches, intellectual role taking is only powerful in the hands of a skilled teacher. Deep content knowledge and pedagogical content knowledge (Shulman, 1987) are needed to understand how to identify key ways of thinking like scientists, historians, and mathematicians that are relevant to particular areas of study within each discipline. Ensuring that intellectual roles are used in conjunction with sets of activities that are well ordered and support the development of conceptual understanding of a particular kind is also essential. An understanding of one's students is paramount. Collecting a wisdom of practice around questions such as, "What do students typi-

cally struggle with as they try to grapple with explaining sinking and floating?" "How do students come to understand what 'theory' means?" and "How can I reach Johnny or Jane who won't engage—what have I tried before in these situations?" is necessary. It is also important to be prepared to adapt in the face of challenges that explicitly changing classroom rules as usual will undoubtedly bring. Most important, teachers must believe that all students have something important to contribute, intellectually and socially, to the life of the classroom. Teachers must commit daily to finding innovative ways (of which intellectual roles may become but one of many tools) to embrace heterogeneity and help all of their students contribute in ways that make them feel comfortable and help the class together realize in Meier's (1995) words "the power of their ideas."

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### Notes

1. Eighteen of the 24 students were from minority backgrounds. Six of the students spoke English as a second language. Four of the students were eligible for special services due to learning disabilities and 54.2% of the students were eligible for free or reduced price lunch. See Herrenkohl, Palincsar, DeWater, & Kawasaki (1999) for further analyses involving this class.
2. Direct quotes from the teacher come from her written record of the event.

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