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ABSTRACT

Derived from the perspective which views teachers and students as rational humans with limited capacity of perception and reasoning, this study describes how teachers differentially treat students and examines what underlies the differential treatment. Three science teachers from an urban middle school in the Midwest participated in the study. Classes were observed; formal and informal interviews with teachers, administrators, and students were held; and various kinds of instructional materials were gathered. Findings are summarized as they relate to treatment of whole classes, individual students, and teachers' perceptions of their role. Teachers' treatment of whole classes is described under the topics of content taught, teaching strategies, attitudes toward students, and evaluation of students' performance. Teachers' treatment of individual students is reported based on their actions in handling disruptive, passive, and highly motivated and able students. An overview is presented on how teachers differentially perceived their whole classes and individual students within a class. The possible reasons behind teachers' perceptions and actual treatments are then discussed. A reference list is also included. (ML)

Differential Treatment of Individual Students and Whole Classes by Middle School Science Teachers

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INTRODUCTION

Shulman and Carey (1984) categorized the human capacity for reasoning and reasoned choice into four perspectives: man as rational, man as irrational, man as boundedly rational, and man as collectively rational. The framework of interpretation in this study is to see humans as boundedly rational. This view sees humans as indeed rational, but that rationality is limited by certain intrinsic characteristics of human perception and cognition:

> The first consequence of the principle of bounded rationality is that the intended rationality of an actor requires him to construct a simplified model of the real situation in order to deal with it. He behaves rationally with respect to this model, and such behavior is not even approximately optimal with respect to the real world. To predict his behavior, we must understand the way in which this simplifed model is constructed, and its construction will certainly be related to his psychological properties as a perceiving, thinking, and learning animal (p. 199).

Theory and research in contemporary cognitive psychology, unlike their forbearers, recognize that these limitations, rather than nuisances to be overcome, are intrinsic to human perception, thought, and reasoning, and constitute some of the most important human intellectual virtues. Because humans lack the cognitive capacity to apprehend the world as it is, we are forced to construct representations of that world. Thus, our virtues of being active, inventive, constructive thinkers are simply our only available means for coping with the limitations of our capacities.

Discussing research on teachers' thought processes, Shavelson and Stern (1981) state that human capacity for formulating and solving complex problems such as those presented in teaching is very limited compared with the enormous capacity of some ideal model of rationality. In order to handle this complexity, a teacher constructs a simplified model of the real situation. The teacher, then, behaves according to this simplified model. The issues

related to this conception of teaches with "bounded rationality" are whether or not this simplified model of the real situation is guided by this model.

From the perspective of teachers and students as boundly rational humans with limited capacity of perception and reasoning, the purpose of this study is to describe the following research questions:

a. how middle school science teachers differentially treat whole classes of students with different levels of ability, in terms of content taught, teaching strategies, attitudes toward students, and evaluation of students' performance;

b. how middle school science teachers differentially treat individual students within a class and how this practice is related to the treatment of the whole class; and

c. what underlies any differential treatment that may occur; that is, how secondary school science teachers understand their teaching roles with regard to science content and students.

In this study, we will describe how teachers differentially treat individual students of whole classes. More importantly, we will try to understand what lies behind their practice, in this sense that the ways secondary science teachers perceive their teaching roles are related to their treatment of students. The practice of differential treatment by teachers and their conception of teaching roles will be interpreted from the perspective of man as boundedly rational.

FRAMEWORK OF INTERPRETATION: MAN AS BOUNDEDLY RATIONAL

The research on teachers' expectations and differential treatment of students is related to the question of bounded rationality. As a way of facing the complex situation of dealing with students, teachers develop their own impressions and predict the performance of classes or students in a class. Unfortunately, teacher expectations are a sort of double-edged sword. If

teachers' predictions about students are accurate, reality-based, and open to corrective feedback, this leads to adaptation of instruction to the needs of individual students. However, if the expectations are sustained, systematic over- or under-estimates of students' actual potential, or based on stereotypes of race, gender or social class, this will lead to discrimination against particular types of students through inappropriately limited forms of instruction (Brophy, 1982).

The teachers' expectations and attitudes about different students can lead them to treat students differentially, so that teachers' predictions of students sometimes become self-fulfilling. A particular danger is that low expectations combined with an attitude of futility will be communicated to certain students, leading to erosion of their confidence and motivation for school learning. This will confirm or deepen the students' sense of hopelessness and cause them to fail even where they could have succeeded under different circumstances (Good & Brophy, 1978).

The way teachers define their teaching roles leads them to attribute a student's performance to two different patterns: (a) ego-enhancing or (b) counter-defensive (Clark & Peterson, 1985). Teachers with ego-enhancing or self-serving attributions ascribe a student's successful performance to themselves as teachers, but a student's failure to factors other than the teacher, and especially to the student. In contrast, teachers with counter-defensive attributions accept responsibility for students' failures and give credit to the students themselves for success. To the extent that teachers maintain ego-enhancing attributions, the limitations of bounded rationality become a serious problem, especially to disadvantaged students.

The students as recipients of teaching are also actively constructing and reflecting on their constructions to make sense of the world, solve problems, and learn. This view of learners bears not only on their knowledge and self-consciousness, but also on their attitudes toward learning and teaching in general. The learners do not just remain passively influenced by teachers. The students themselves possess the ability to resist by refusing to learn what the teacher intends should be learned (Erickson, 1985). This means that, in a teaching situation, the teacher must somehow persuade the students that his or her guidance is legitimate and in the student's own interest. If the student perceives his or her interest to be fundamentally in conflict with that of the teacher, the student resists the teacher by actively withholding learning, and the teacher is unable to teach.

Concerning the issue of differential treatment by teachers, a number of research studies have investigated teacher expectations with a view to studying teaching effectiveness (Brophy, 1982). In this study, however, we are not much interested in how differential treatment by teachers results in differential teaching effects with individual students or whole classes. Rather, we are interested in describing what happens in classrooms and understanding what underlies these events from the teachers' perspectives. In this article, we first describe differential treatment by teachers as viewed through classroom observation. Then we try to understand what lies behind this treatment through formal and informal interviews with teachers and occasionally with students. Due to the nature of these questions, the approach used is ethnographic.

ACCESS TO THE SITES

This study is a part of a research project in which about 1,000 secondary school science classes were observed (Gallagher, 1985). In addition to classroom observations, formal and informal interviews with teachers, administrators, and students were held. Various kinds of instructional materials including test sheets and assignment sheets, as well as announcements and documents in the school buildings, were also gathered.

The school involved in this study was a medium-sized urban school in the Midwest. It was located in a middle class neighborhood. The students in this school ranged from sixth through eighth grade. This school drew a varied population of students representing a range of socio-economic and racial backgrounds with approximately 40% of the student population Black and 15% Hispanic and Oriental. This proportion of ethnicity was reflected in the make-up of teachers, and the school had a black principal.

In this school, there were special programs called "enrichment programs" for grades 7 and 8 in English, math, and science for students who were supposed to be the highest achievers in each subject matter. In the case of science, there were two enriched classes in grade 7 and two in grade 8. The criteria for students to be assigned to the enriched classes in science included a recommendation letter from the former science teacher and the student's grade of the previous year. The school administrators selected the students every summer.* Most students had received A's and very few B's in science during the previous year. However, there were a few cases in which parents strongly urged their children to be in the class and the teacher

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* Unlike SAT in English or math, there is no standardized test in science.

agreed to recommend them. One of the assistant principals in the building reported that most of these students were successful.

In this study, we worked primarily with three science teachers in the school, who will be called Mr. White, Mr. Brown, and Mrs. Green.* All of them were experienced teachers and good classroom managers. They had enriched classes; but they all also considered certain regular classes to be their "problem" classes. The fact that the teachers talked about certain classes in certain ways already during the first week of the school year or at our first classroom observation piqued our curiosity as the start of this study. With a view to comparing and contrasting differential treatment of classes of students having different ability levels, we observed one enriched class and one regular class with each teacher for the duration of a semester or so.

We will now describe how we got into the sites with these three teachers. In February 1985, one of the researchers began to observe one of Mr. Brown's eighth grade classes. Mr. Brown, a white male science major, had taught science for 17 years. He was teaching one enriched eighth grade class and other regular seventh and eighth grade classes. During her first visit, the researcher noticed that, unlike other classes with mixed ethnicity in the school, there were only three black female students among 32 students present (and 34 enrolled), the rest being white male and female. She talked to Mr. Brown about her impression. He responded that this was true in this class but that things were exactly the opposite in his second hour class. In the second hour class, most of the students were black. The students in this class were higher achieving students, while those in his second hour class were lower

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* The names used in this article are all pseudonyms.

achievers. He commented that the researcher would be in a totally different situation in his second hour class. The students in this class were behaving themselves in class, while there were a lot of behavior problems in the second hour class. He pointed out that he could talk with her while they were working, which would not be possible with the second hour students because they would become noisy if he talked more than a minute. He said he had to pay attention to them all the time. He explained that among the five classes he taught each day, one was a higher achievement class, another was lower achievement class, and the rest were normal classes. Many students in this class got A's and some B's. In contrast, many students in his second period got below C's. He suggested that she come to his second hour class to see the differences. Following his suggestion, we began to observe Mr. Brown's seventh grade regular class second hour and eighth grade enriched class third hour. Even though Mr. Brown introduced his second hour class as "lower achieving students," there was no tracking for low-achieving students in the school.

In the case of Mr. White, we were observing his first hour class at the beginning of the first semester, 1985. Mr. White, a white male science major, had taught science for more than 30 years. He was teaching seventh grade classes, including one enriched class. In our second visit three days after school started, he suggested we come back for his fourth hour. He said the class was totally different from other classes, like his second hour class last year. We began to observe his first hour enriched class and fourth hour regular class, occasionally visiting his second and third hour classes also.

The following anecdote provides a clue to understanding how Mr. White perceived his four classes.* AT the beginning of his second class period one day, Mr. White told the class, "This class is really good. I got good report from the sub yesterday. The third and fourth hour classes are not as good as this one. In the fourth hour, they just can't do it. This class is really good. The first hour is an enriched class. You will be doing most of the work as in the first hour class."

Mr. Brown was not teaching any enriched class in the 1985 school year. He introduced one of the researchers to Mrs. Green. Mrs. Green, a black female with a major in social studies and a minor in math and science, had taught science for nine years. She was teaching eighth grade classes, including one enriched class. We started observing her third hour enriched class. After a couple of visits, we asked her whether we might observe another class, probably a class she had a hard time dealing with. Mrs. Green immediately responded that we should come to her sixth hour class. She said the researcher would see something different in the class and asked the researcher to tell her about it. She said she didn't know how other people could handle that kind of class. It was not a class she would get every year but once in a few years, and she got one this year, she said. At the second visit to her regular class, one female student greeted the researcher and asked, "Why do you choose us? Because this is a bad class?" The girl giggled. The researcher said, "No. Just because this class fits my schedule."

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* Since Mr. White was the department chairperson, he taught four classes per day rather than the normal load of five classes.

From the conversations with each of the three teachers, we saw a common element that all of them had constructed simplified models of certain classes. Interestingly enough, their models of certain types of classes were very similar: that is, they seemed positive toward enriched classes but reluctant toward "perceived problem" classes. Our interest during the observations was to investigate how the teachers, possessing simplified models of real classrooms, actually behaved in the classroom and explained or rationalized their practices.

In the remainder of the article, we will first describe how the teachers treated the whole classes. Then we will describe how the teachers differentially treated individual students within a class. Since our emphasis in this article is on differential treatment of whole classes by the teachers rather than differential treatment of individual students within a class, we will focus on how such treatment of individual students is related to treatment of the whole class. Finally, we will try to understand how the teachers perceived their teaching roles and the students.

DIFFERENTIAL TREATMENT OF WHOLE CLASSES

The teachers' treatment of two types of classes will be described under four topics: content taught, teaching strategies, attitudes toward students, and evaluation of students' performance. These four topics are crucial aspects of teaching. All three teachers demonstrated varying degrees of differential treatment of whole classes.

Content taught. In the cases of Mr. White and Mrs. Green, content of instruction in enriched and regular classes was almost the same. However,

they gave extra projects only in enriched classes.* The examples with each teacher are as follows.

The students in Mr. White's enriched class spent three class periods in fall working on a project collecting tree leaves. Many students collected more than 20 kinds of leaves and some collected more than 30 kinds. In the final class hour for the project, some students selected good quality leaves, pasted them on colored paper, and decorated the bulletin board. In the regular class, one girl pointed to a leaf decoration on the bulletin board and said to the researcher that her best friend did it. The researcher asked her whether they did the project in class. The girl said, "No, we didn't. The enriched class did."

The students in Mrs. Green's enriched class spent five class hours in the library working on a report on minerals after doing a chapter on minerals. They collected information on 16 minerals following an example on a sample sheet. They were supposed to cite references correctly. Mrs. Green introduced the project, "It's more like a research report." Not only was this project not assigned to the regular class, the regular students had never worked in the library during the whole semester, even though the library was located just across from the classroom.

Our observations showed that the content of instruction in each lesson was not different in enriched and regular classes. However, since the teachers perceived that enriched students could move faster and handle more work than regular students, they assigned extra projects to enriched classes.

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* Content of instruction with Mr. Brown will not be discussed due to grade level differences between the two classes.

These not only counted for extra credit, but also constituted important learning activities.

Teaching strategies. The teachers in enriched classes presented information in ways that interested and motivated students. Things ran smooth in enriched classes without any interruption during class. In regular classes, in contrast, they constantly paid attention to managing students' behavior. Their attempts to sustain group focus on academic lessons were frequently disrupted by students, and more time was lost in transition between activities. The following are the evidence.

Mr. White's first class period started at 8:20 a.m. after the announcements on the loud speaker. Students were supposed to be in their classroom before the announcements. Mr. White one day started his first hour class at 8:15, five minutes earlier than the class period, as he sometimes did. He started the class by saying that he was happy with students' good job on the test, since most got A's and a few got B's. He said he wanted to have their parents to be there to hear that they had done a real good job. Then, introducing a film on parasites, he commented, "Parasites is an interesting area of study." At the end of the class, he told the class, "Gang, have a nice weekend. I am really proud of you." In contrast, Mr. White usually started his fourth hour regular class at 11:05, five minutes later than the beginning of the period. On this day, he started the class by scolding a boy and moving him to a back seat. The boy grumbled. Then Mr. White said he was not sure whether the film would tell the answers for the three questions on the board which the students were supposed to respond to after the film. The class finished without any concluding remarks by the teacher.

As another example, Mr. White started his enriched class at 8:16 a.m. by telling the class to read certain pages in the textbook before watching the film. Introducing the content of a film, he told the class, "I am always fascinated by coelentrates. This is an interesting area of study." Asking the observer whether she had ever been to an aquarium, he said, "You will be interested." In contrast, Mr. White started the fourth hour regular class at 11:04 by scolding the class, "Do you want to continue this class or let Mr. Jones have the class instead?" The students answered, "No." After reminding the class to be quiet, he told the class to read certain pages before the film. He did not say anything to the class in order to interest the students in the content of the film.

The predominant activity in Mr. Brown's class was seatwork. In his enriched class, he let students work together and students changed seats to form their own groups. Mr. Brown walked among the students to help them with their work. Students asked questions of the teacher and he responded cordially. In the regular class, in contrast, he had students work alone at their assigned seat. He did not help them with their seatwork. Students did not ask questions and he did not volunteer assistance. His major role in this class seemed to keep the class quiet. Not given a chance to talk to each other, students were constantly seeking ways of interacting with others. Some students were glancing at others, signaling or smiling to others at a distance, or exchanging notes under the table, instead of working on the assignments. Thus, even when the class appeared quiet on the surface, the class felt unstable. In a few cases when the students were allowed to work in groups, if they began to talk, Mr. Brown warned, "If you keep noisy, you will work alone."

The two examples from Mr. White show how differentially he treated the two classes. In the enriched class, he structured the instruction to motivate students as well as to engage them more in the material. In the regular class, in contrast, his attention was more on managing students' behavior than teaching the content in such a way as to engage or interest them in the content area. The example of Mr. Brown also shows his differential treatment of the two classes. His faith in enriched students allowed them to be engaged in substantive work through cooperative learning with peers. However, his lack of confidence in regular students prevented them from being engaged in interactions with other students or the teacher either academically or socially. Thus, the teachers seemed to behave in classrooms in a manner consistent with their pre-established perceptions of enriched or regular classes.

Attitudes toward students. The teacher interacted with enriched class students in a personal, cordial way. They seemed to enjoy the person-to-person relationship with individual students in enriched classes. In regular classes, in contrast, their behavior toward students appeared detached. They were constantly on the watch for misbehavior. They maintained impersonal group identity in regular classes at the cost of personal relationships.

Mr. Brown's behavior differed sharply in his two classes. He seemed to have different personalities. He was warm and personal in his interactions with enriched class students. In the regular class, however, he was strict and kept a distance from students, both physically and socially. He repeatedly warned students of the consequences of misbehavior. Thus, he allowed his enriched students to monitor themselves and gave them responsibility for their behavior. The students in the regular class,

however, were deprived of opportunities for self-regulating or self-monitoring (Anderson & Evertson, 1978).

Mr. White behaved similarly to Mr. Brown in his two classes. He was basically a nice person to individual students. In the enriched class he was informal and cordial, as if he perceived interactions with the whole class as a collection of personal relationships with individual students. In his regular class, however, he became strict and formal. He seemed to disregard individual relationships with students in order to keep the whole class under control.

Mrs. Green behaved rather reasonably in her two classes. Even though she was rigid in both classes, she was less formal in the enriched class. However, she was not so lenient as to give total freedom to the enriched class, nor as strict as to watch over the regular class every minute. Contrary to Mr. White or Mr. Brown whom we rarely observed scolding their enriched classes but often scolding their regular classes, Mrs. Green occasionally scolded her enriched class as she did her regular class, though this occurred a little more often in her regular class. After telling the enriched class to be quiet twice in succession at the beginning of a class period, Mrs. Green scolded the class, "You are not supposed to talk in class. I don't have to ask you to be quiet three or four times each time."

The examples with the three teachers suggest there is a common strand among the teachers, that they were more personal and cordial in enriched classes, while more strict and formal in regular classes. However, there is also an implication that to the extent a teacher is aware of his or her behavior in a class, he or she can decrease differential treatment of the whole class to a lesser degree. Mrs. Green is a case in point. In contrast

to Mr. White or Mr. Brown who manifestly behaved positively to enriched class and negatively to regular class, Mrs. Green seemed more conscious of her treatment of a class.

Evaluation of students' performance. Teachers' differential treatment of whole classes was also revealed in their evaluation of students' performance. The following are examples of how teachers handled formal evaluation of students' performance.

Students' end-of-semester grades in Mr. White's four classes and Mrs. Green's two classes are presented in Table 1. According to Mr. White, his first hour enriched class was the best; second hour class, good; third hour class, bad; and fourth hour class, the worst.

Table 1

Students' End-of-Semester Grades

	Mr. White				Mrs. Green	
Grade/Class	Enr.	(2nd)	(3rd)	Reg.	Enr.	Reg.
A:	26	3		1	16	4
B:	2	13	10	9	9	8
C:		2	16	10	1	6
D:		6	4	5	1	9
E:		1	1	1		2
Total	28	25	25	26	27	29

We first notice some differences between Mr. White's two classes and those of Mrs. Green. Almost all of the students in Mr. White's enriched class got A's, while the majority of students in his regular class got B's, C's, and D's, with only one A. In Mrs. Green's enriched class, in contrast, a substantial number of students got below A, while several regular class students got A's. We also notice that in Mr. White's four classes, there is a trend of decreasing grades from the first hour through the fourth hour class, which seems consistent with his description of the four classes.

In the case of Mr. Brown, we failed to get the information about students' grades. However, Mr. Brown once reported that most students in his enriched class got A's and some B's. In contrast, many students in the regular class got below C's. Here again, we notice the teacher had already developed perceptions and expectations of whole classes and seemed to grade accordingly.

DIFFERENTIAL TREATMENT OF INDIVIDUAL STUDENTS WITHIN A CLASS

On the basis of classroom observations in secondary school science, we identified three types of students within a class whom teachers treated differentially: (1) disruptive students; (2) passive students; and (3) highly motivated and able students, called "target students" (Gallagher, 1985). Target students, as a select group, received more questions of higher cognitive level. They were encouraged to speak more and were given more freedom and responsibility in class (Gallagher & Tobin, 1985). Disruptive students, however, were constantly warned of the consequences of misbehavior, and teachers often dealt with them impatiently. In general, disruptive students and target students got most of the attention from teachers, while

the majority of other students received little attention during or after class.

In regular classes, differential treatment of individual students was observed with target students and disruptive students. However, it was not apparent in enriched classes. The following is an example of differential treatment of a target student. In his regular class, Mr. White asked the class the distinction between two words, control and experiment. Only Tracy raised her hand in class. Mr. White designated another girl to answer. The girl murmured. He said to her, "Control means to turn your face to the front, right?" The girl tried, "Control means...", and became silent. During this interaction, Tracy put her hand down. Mr. White designated another girl, and she said, "I don't know." He then turned to Tracy and said, "OK. Tracy." She gave a correct answer. In several subsequent observations, Tracy was the one who answered the most during whole-class interactions involving the teacher. It was not long before Tracy was moved to Mr. White's enriched class.

When dealing with disruptive students in his regular class, Mr. White most commonly resorted to having them sit alone at the back of the room. There were three black male students who frequently sat at the back seats, in turn or even at the same time. A high proportion of negative statements Mr. White addressed to the whole class were actually aimed at these three students.

The effects of differential treatment of individual students by teachers were not confined to those students involved. Differential perceptions of individual students by teachers affected their perceptions of whole classes, which led to differential treatment of whole classes. The negative effects of

these relationships were most evident in regular classes. Students were regarded as disruptive or potentially disruptive. The following examples show how teachers' differential treatment of individual students are related to their differential treatment of whole classes, especially regular classes.

Mr. White's frequent negative statements toward these students not only changed the classroom climate, but also interrupted the flow of instruction. Mr. White enjoyed good relationships with individual students. He told us that he tried to get his students to like science and also his class. However, he spent much of his regular class time attending to the behavior of a few students, especially three black male students. He constantly watched over these students and warned them of misbehavior in class. The three black male students were once working together on an assignment for the previous day at the back of the room, while other students were involved in class discussions. The three students occasionally made noise talking to each other. Mr. White repeatedly singled them out and warned them three times to be quiet in class. Suddenly dropping the textbook on the floor, he yelled at them, "I am sick of you there. You have been talking all the time and interrupting me and other students in class." There followed complete silence in class as Mr. White did not resume talking for a while. At another time, Mr. White scolded one of the boys, "I don't want you to make noise. If you don't feel good, don't come to my class." We could occasionally hear him saying to students in class, "I am sick and tired of you."

As mentioned before, one predominant activity in Mr. Brown's class was seatwork. Since he was not involved in whole-class interactions with students through lectures or discussions, his differential treatment of individual students was not obvious. However, as he perceived his regular class having

"a lot of behavior problems," he regarded the whole class as potentially disruptive. Thus, as a way of preventing any misbehavior during seatwork, he limited his own interactions with students by keeping a distance from them, as well as restricting interactions among students.

Mrs. Green complained to us that she had several "mind-bugging" students in her regular class. During our classroom observations, however, she seemed to make an effort to treat every student fairly. No student was apparently identified as receiving different treatment in her regular class, and thus the whole class was not affected much by her treatment of individual students. Sometimes she was positive to students. For example, when a boy almost gave up answering a sequence of questions by Mrs. Green, she said, "I'll give you a chance to answer. I will help you." She stretched him to the limit by asking several intermediate questions. When the boy finally go the answer, the class gave him a hand. She did sometimes respond negatively to students by saying, "Don't be silly," or "Don't be funny." But what is worth mentioning here is that, contrary to her remarks about several students that she perceived as different from other students or difficult to deal with, Mrs. Green still seemed to treat them on equal terms. This will be discussed in the next section.

In sum, we see how teachers' differential treatment of individual students in a class is related to their treatment of the whole class. Differential treatment of individual students, originating to a large part from teachers' perceptions of several disruptive students, led to negative effects on a whole class. However, as in the case of Mrs. Green, teachers' perceptions of individual students can be more balanced by reality, to the extent human capacity allows.

TEACHERS' PERCEPTIONS OF THEIR TEACHING ROLES AND THE STUDENTS

What struck us the most with the teachers was that, just three days after the school started or during our first classroom observation, they complained about certain classes as "problem" classes. They introduced these classes, "My fourth hour class will be a problem," "Come on in my second hour class and see the difference," or "Come in my sixth hour. You will see something different and tell me about it." They had developed certain expectations of whole classes or individual students and seemed to be pleased to tell others the problems they perceived in certain classes.

After getting into the sites, we conducted a lot of informal interviews with the teachers in order to understand their perceptions of their teaching roles and the students. We recognized that the way teachers perceived their teaching roles and their students underlay their actual practice of teaching. However, there were degrees of variation among the teachers with regard to differential treatment of classes or students. For example, Mr. White and Mr. Brown held particular perceptions and expectations of whole classes and individual students, and these became manifest in their teaching of content and interactions with students in class. Mrs. Green also held different perceptions of several students, and to a certain degree, treated her two classes differentially. However, she was more aware of her behavior toward whole classes or individual students. In this section, we will first describe how the teachers differentially perceived their whole classes. Then, we will describe the teachers' perceptions of individual students within a class.

Perceptions of whole classes. Mr. White's perception of his two classes were completely different. He perceived his enriched class as pleasant to teach and the students as capable of good performance. The following are some

examples. Raising his right thumb up, Mr. White said of his enriched class that they were the best students in science. He said he wanted to go camping with all his enriched students but wondered how many he would take from his regular class. He also remarked that if he lost his gradebook, he would give all A's to his enriched students.

In contrast, Mr. White perceived his regular class as difficult to teach. He attributed the failure of students' learning to external factors, especially to the students, rather than to himself. He showed the researcher the results of students' reading skills tests. There were more students having both major and minor reading difficulties in the regular class than in the enriched class. Pointing to the test scores of the regular class, Mr. White wondered how he could teach students who had difficulties even reading the textbook. After a lab class, he commented that some of the students could not read the clock and thus could not measure a minute in class as part of the lab work. Talking about the importance of education, he said, "These students come from families of people who do not value education. Who cares about school?"

Mr. Brown's perceptions of his two classes were also totally different. In the enriched class, he gave students freedom and responsibility for self-monitoring in class and allowed them to work in groups, which would involve students' interactions among themselves and with the teacher. He commented about his enriched class that he just pointed out to students what to do and they did it. With very difficult content, he told them main ideas in the textbook and they learned by themselves.

Mr. Brown's perceptions of the regular class was lack of confidence in students' ability. For example, after giving instruction on an assignment for

the day in the enriched class, he told the researcher that that assignment would take two hours with regular class students. Asked whether or how often he let the regular class work together in groups, Mr. Brown said he tended not to allow that because if the students worked together they would just talk and could not get work done. Meanwhile, he said, the enriched class students would get things done anyway. The researcher probed his perception further by asking him what would be different if his enriched class students worked together or independently. He responded that working together would be more effective because they could exchange ideas with each other. Thus, Mr. Brown's perceptions of the two classes were different and he behaved accordingly in the classrooms.

Despite Mr. Brown's confidence in the enriched class, his students did not necessarily perceive his teaching the way he intended to. As an example, the class had been working on a project for three class periods. The researcher asked students at a table when they were supposed to finish it. They said they didn't know when it was due. One person grumbled that Mr. Brown had not given any instructions even though the assignment was very difficult. He said they had to read all the instructions and find out how to do the assignment. Also, during seatwork in the enriched class, there was socialization as well as discussion of the content. Occasionally some students were copying down answers from other people's assignment sheets. Thus, Mr. Brown's over-confidence in the enriched class might not serve his students' needs anymore than his lack of confidence in the regular class did.

Mrs. Green's perceptions of the two classes seemed more realistic. She stated that she tried to be honest and fair with students, not too rigid nor too nice. She first indicated the ease of teaching in the enriched class in contrast with difficulties in the regular class. For example, she said the

enriched class students were smart, moved fast, and did what she told them to do. Even when she didn't tell them exactly, they figured out for themselves. In contrast, regular students could not concentrate, and it made her tired because she had to watch over them all the time.

However, Mrs. Green also perceived her role of teaching as a facilitator of students' learning. For example, she said it was not fun to teach the enriched class because they knew what to do and thus didn't need her help as much as the regular class. Meanwhile, regular students were a little slow and took a while in learning. However, when she saw something on students' faces that was a sign of their understanding the content, she experienced the fun of teaching. Commenting on students' behavior in class, she said she might yell more often in the regular class, because the enriched students behaved better. But if she let the enriched class loose, they would behave the same as any other classes.

Thus, the teachers developed certain perceptions and expectations of whole classes. However, we again see degrees of variation among the teachers. With Mr. White and Mr. Brown, their perceptions of whole classes suggested sustained over-estimation of enriched classes and under-estimation of regular classes. In contrast, Mrs. Green's perceptions of whole classes seemed more reality-based. She recognized both the positive and negative aspects of the two classes. She was also aware of her role as a facilitator of students' learning, which neither Mr. White nor Mr. Brown perceived.

Perceptions of individual students. Mr. White frequently mentioned three black male students in his regular class. On the way to the cafeteria for lunch with the researcher, Mr. White complained about one of them. He said Steve didn't do anything in the lab and he knew he would give him a E. Steve

was one of the worst students he had ever had. He wanted to trade Steve for any two students in another seventh grade class. He bet that he would be happier with any two students than with Steve, however bad they would be. He told the same story to other teachers at a table during lunch.

Mr. Brown told the researcher that there were about four or five good students out of 26 students in his regular class. During the students' seatwork, the researcher approached a student in order to see how students perceived this issue. Roberto said the seatwork assignment for the day was a little easy. Asked whether students in the class were smart, he was quick to say, "No." Then asked how many students he thought were good, he waited a while and said, "Five or six students."

Mrs. Green talked a lot about individual students. Some of them she felt uncomfortable with in class. She discussed Andy, whom she had had in sixth grade two years ago. He was smart, but had some emotional and social problems. He had caused a lot of trouble before and during this year. When she first saw him in class this year, she sighed, "My goodness." She sometimes scolded him severely in class, but she thought he knew that she did not really dislike him. Mrs. Green also talked about Judy. She said she didn't like her because Judy constantly talked and never knew when to shut up. About Mark, she said he sat in class without ever speaking but was always waiting for her to lose her temper. When that happened, he grinned at her. When he was not in class, she felt everything normal and comfortable. But when he was in class, she felt anxious. He was suffocating her. Fortunately, he was absent a lot.

Mrs. Green also commented on several students she tried to help. She said Chris had been doing fine in her class last semester. He got a B in her

class, but got lower grades in all the other classes. He was moved to another class this semester. She would like to take him back in her class and he wanted that, too. He knew he would be doing fine in her class because she made him work. Two weeks after the second semester started, she took him back in spite of some argument from his temporary science teacher. Mrs. Green also discussed Eric, who was a neighbor of hers. His mother regarded him as very bad, but she thought he would have done better if he had been in a better family situation. She thought she could have helped him if he had stayed in her class in the second semester.

Mrs. Green talked about two students in her enriched class several times. At the end of the first semester, Sue got a C and Tom got a D. She said Sue didn't know she was in an enriched class until she was told. Sue always got the second lowest scores in the class. Sue's parents might have pushed her to study more. About Tom, she said he was not supposed to be in an enriched class but in a regular class. He was just too lazy and disorganized. His mother had pushed him to be in this class. She didn't think he could follow the class, and it was not good for him. At the beginning of the second semester, Mrs. Green reported that Sue's parents had transferred her to a regular class. That might be better for her because she actually was not supposed to be in an enriched class. Tom was still in her class. She couldn't understand his parents and was convinced that they should have taken him out to a regular class.

We again see that teachers perceived individual students in different ways. Without further information about Mr. White or Mr. Brown, it is hard to interpret their perceptions of individual students. Mrs. Green, on the contrary, often talked about individual students. This seemed to be an

indication that she was concerned with individual students. Actually, she knew a lot about students' personal affairs, more than just whether so-and-so was a good student or not. Her comments on each individual student reveal the nature of human capacity for reasoning. On the one hand, she held negative perceptions of certain students which involved not only rationality but also emotion. At the same time, she also developed reasonable perceptions and expectations of students. For instance, her comments on students' performance revealed that she attributed their failure of performance to other factors, as well as to the students themselves. She also showed her commitment to help them. Note, however, that she did not seem to attribute it to herself as a teacher.

Implications

Acknowledging that teachers, as all humans, are boundedly rational having limited capacity of perception and thinking, we agree that teachers need to simplify a complex situation, such as a classroom of 30 students, in order to deal with it. The issue of differential treatment by teachers is not whether teachers construct representations of the real world, but how they construct a simplified model and behave with respect to this model. When teachers' perceptions and expectations of classes or students are based on more realistic understanding, their practice of teaching will be facilitative of students' learning. In contrast, when they construct representations of classes and students in inaccurate or distorted ways, its influence may be deleterious, especially to disadvantaged students. Thus, depending on their perceptions and expecations of classes and students, teachers may treat them in different ways.

In this study, we described how three middle school science teachers differentially treated whole classes and individual students, as viewed through classroom observation. Through conversations with the teachers, we then tried to understand how they perceived their teaching roles and the students. One of our research questions in this study was to see how teachers' perceptions of classes and individuals were related to their actual behavior in the classroom. Our assertion on this question was that teachers' perceptions of their teaching roles and students influence their actual practice of teaching. Evidence from various sources of data support our assertion that teachers' perceptions of their teaching roles and students indeed lead to their differential treatment of whole classes and individual students.

Then, what are the possible reasons behind teachers' perceptions and actual treatments of classes or students in different ways? At this moment, we may have partial answers which can be interpreted from the perspective of man as boundedly rational.

The first reason is the role definition of secondary school science teachers. They seemed to perceive themselves as subject matter specialists. Teaching the content is their primary function. The rationale of the teachers seems to be like this: I will present information to students and it's their responsibility to learn; the motivated and able students will learn and the rest won't. Thus, their perception of classes and students is that most students in enriched classes and some in regular classes will learn the content; the rest won't.

The second reason, related to the first reason, is teachers' coping and defense mechanisms. The teachers seemed to attribute the failure of

instruction or students' learning to the students or to factors other than themselves as teachers. They perceived that students were responsible for learning the content and, based on this belief system, they rationalized their differential treatment of classes or students.

The final reason for the behavior and perceptions of teachers which we observed is their need for control. The teachers feared loss of control in class, especially in perceived problem classes. They perceived classroom management as fundamental for good teaching. Thus, they were more rigid and attended to students' behavior in regular classes at the expense of instruction.

What implications does this study have for improving science teaching in secondary school? First, simply making teachers more aware of the practice of differential treatment may induce them to assume more responsibility for all students. Mrs. Green was an example. Unlike the other two teachers, she was aware of the possible effects of her differential treatment as a teacher on students. Secondly, teachers need feedback from their students, colleagues, and supervisors if they are to become more aware of instructional practices they have adopted habitually. They also need to be more aware of what they communicate to students through differential treatment. Finally, this study raises a set of important issues about science instruction. This study focused on describing how science teachers perceived or treated their whole classes or individual students in their actual practice of teaching in classrooms. More studies are needed to understand the causes and consequences of differential treatment of classes or individuals by science teachers. In order to study these issues, interviews with teachers about their definition of teaching roles and their rationalization of actual teaching practice would

be informative. We also need to understand teaching practice from the students' perspective: whether they recognize differential treatment by teachers and how they interpret and react to it.

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