

Secondary Science Emergency Permit Teachers' Perspectives on Power Relations in Their Environments and the Effects of These Powers on Classroom Practices

By Hedy Moscovici

Introduction

We live in a changing world in education in general, and in the area of science education in particular. Various major publications such as the National Science Education Standards (National Research Council, 1996) and the collection of research results regarding the use of inquiry methodology in the teaching and learning of science edited by Minstrell & van Zee (2000) recommend that science should be taught in the same way that it is constructed—using inquiry. The National Research Council (2000) takes a step forward and provides practitioners examples and illustrations of how inquiry science looks in the classroom. During inquiries, students ask questions and plan ways to answer them, collect, represent, and organize data

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to create knowledge, and then test the reliability of the generated knowledge. During this process, students learn to cope with difficulties, and react to constructive criticism provided by the teacher and peers. As a result, students re-examine their research, and decide if more data needs to be collected in order to enhance the generalizability of their findings. But, the question is, can students feel empowered to take such a meaningful role in their learning? How do teachers cope with such a change in the teaching and learning roles and how do they solve their discomfort once they get out their “comfort zone”? And, how much support for implementing and sustaining inquiry in the science classroom do these teachers get from their schools and their districts?

This study explores the effect of a teaching module that encourages secondary science teachers working on emergency permits (EPTs) to analyze their power positions within the classroom, their school, district, and community. The teaching module evolved during the past three years. It always began with a short presentation of theoretical perspectives on power relations and the application of these principles to the secondary science methods course I teach. One year ago I extended the assignment to include a paper in which EPTs analyze their power position within a variety of environments to understand how these relations affect their shift toward inquiry teaching and students’ learning of science using inquiry.

Emergency Permit Teachers (EPTs)

Before getting into the various referents of this study, I need to clarify a few details about the special population of students that I teach in secondary science methods. Emergency permit teachers (EPTs) belong to both pre-service and in-service teacher populations (Darling-Hammond, 2001).

Emergency permits are allocated to practicing teacher candidates who are in the process of completing their credentials. This category (Emergency Permits) evolved as the need for teachers in mainly urban areas of the United States (such as New York, Chicago, Los Angeles, Las Vegas, Dallas) exceeded the availability of qualified teachers. Teachers working on emergency permits are required by the school district where they teach to complete their certification requirements in a certain number of years (five years in the Los Angeles area with a minimum of six semester units per year).

Emergency permit teachers are at the same time pre-service - they do not have their teacher credential and in-service - they teach during the day in their own classrooms. Their position requires science methods courses with unique features in order to satisfy their needs.

Theoretical Underpinnings

Constructivism

This study finds its roots in constructivism, in which learning is a social process

of making sense of experiences in terms of extant knowledge (Glaserfeld, 1989; Tobin, Tippins, & Gallard, 1994). The learner modifies her knowledge web in order to accommodate new evidence. This takes place only when the learner perceives the learning experience. In this study, both learning and understanding power relationships were perceived as a pertinent learning experiences for the secondary science EPTs enrolled in the credential program at the university.

Critical Theory

Another theoretical dimension of this study comes from critical pedagogy (Giroux & Simon, 1989). Teachers are defined as transformative intellectuals if they respond professionally to content challenges, as well as to challenges directed to social norms. In other words, such teachers applaud individuals who fight oppression of any kind (Freire, 1990). Such teachers are willing to take the risk of infusing change into their practices. The role of the transformative intellectuals might be also viewed through Anyon's lens (1980, 1997). Her study of the various education systems that grew in relationship to social class reinforces the notion of inequalities that continue to be preserved in support of the *status quo*. According to Anyon (1980), social class lies at the intersection of the following four variables: level of ownership of capital, level of control over content, process and speed of work, and level of critical thinking involved in the work performed. She defines the "working class" at the bottom of the scale, with no ownership of capital, no control over the work performed, and the work involving routine procedures that do not require higher order thinking skills. So, what kind of education do students from the working class need? For example Finn (1999) recommends the use of education principles from the affluent professional and executive elite classrooms in order to improve the reading scores of the students in the working class. He postulates that working class students require the same environment as other social classes:

As working-class children progress through school, their reading scores fall farther and farther below their actual grade level. We presume they don't have the basics, and we give them more phonics. They don't need more phonics. They need to be introduced into and made to feel welcome in a community where explicit language makes sense, where it's necessary—a community where nonconformity is tolerated and even encouraged, where authority is exercised collaboratively, and where students do not feel powerless, where they have choices regarding the topics they will study and the materials they will use and where they are given freedom to work with others (preferably from backgrounds different from their own) and to move around the room. (p.90).

Critical theory tends to assist individuals in understanding their position within a social context and taking action against inequalities in an effort to provide everyone with a chance to fulfil his/her potential.

Power Relationships

In terms of frameworks for the analysis of power relations and control, I found the works of Yukl (1989) and Foucault (1979, 1980a & b) to be instrumental. Yukl (1989) defines power as “An agent’s potential influence over the attitudes and behavior of one or more target persons” (14). His three categories of power—position, personal, and political result from control over different areas. Position power implies control over resources, rewards, and punishments. Personal power, on the other hand, looks at sources of power that depend on the agent’s qualifications and qualities such as expertise, charisma, and friendship. Political power is presented as the result of control over decision processes, and over the development of coalitions. It is important to stress that power relations are dynamic and tend to involve all three categories. Research shows that, at the college level, in classrooms where instructors decided to share their position power and expertise power (part of personal power), and join partnerships with their students in areas of political power increased students’ learning and resulted in a higher degree of comfort with the subject (Moscovici, 2002).

Foucault (1979) looked at the inter-dependence of power and knowledge and reaffirmed that one can not find any situation in which there are no power relationships:

Perhaps too, we should abandon a whole tradition that allows us to imagine that knowledge can exist only where power relations are suspended and that knowledge can develop only outside its injunctions, its demands, and its interests. Perhaps we should abandon the belief that power makes mad and that, by the same token, the renunciation of power is one of the conditions of knowledge. We should admit rather that power produces knowledge (and not simply encouraging it because it serves power or by applying it because it is useful); that power and knowledge directly imply one another; that there is no power relation without the correlative constitution of a field of knowledge, nor any knowledge that does not presuppose and constitute at the same time power relations. (p. 27).

For Foucault, power “is the name that one attributes to a complex strategic relationship in a particular society” (1980b, 93). Power is exercised in relationships ensuring that certain actions modify other actions.

In order to engage in analysis of power relations, Foucault (1983) suggests investigating five conditions:

1. A system of differentiation (for example the fact that EPTs fall lower in status when compared to credentialed teachers);
2. Maintaining the objectives of the oppressors (for example, lower pay for teachers working on emergency permits ensures availability of cheap labor);
3. A system for ensuring power differentiation (for example, emergency permit teachers can be fired without a reason and by that one can damage their chances of getting hired somewhere else);

4. Forms of institutionalization (for example, the Teachers' Union gathers moneys form EPTs but does not have to fight for their rights);
5. Rationalization for the situation (in the case of EPTs the rationalization is that EPTs are not credentialed teachers yet, even though some might have seven years of teaching experience and have a richer teaching repertoire than many of the new credentialed teachers).

The idea of integrating social constructivism with critical theory and the analysis of power relationships is essential in this study because it is not enough for the EPTs enrolled in the secondary science methods to reflect and understand the experiences that proved to be extremely important for their development. They also need to feel empowered to express themselves outside the methods course and be able to take action.

Design and Procedures

As mentioned in the introductory section, the class assignment for the secondary science methods students evolved during the six semesters of this study. During the first two semesters, secondary science EPTs were introduced to the critical theory (Giroux & Simon, 1989; Freire, 1990) and the notion of power relations at the classroom level (Yukl, 1989; Foucault, 1979). The experience was enhanced in following two semesters by having students analyze the science methods class that I was teaching using power relationships as the critical lens. The analysis was used as a group exercise to enhance EPTs understanding regarding the dynamic aspect of power relationships. During the fifth and sixth semesters of this study a written paper was added as a requirement. In this paper, EPTs were required to describe the dynamics of power relations in their life as a secondary science EPT. Their paper needed to include their perception of power in relationship with their students, the school administrators, school faculty, parents, community representatives, and district personnel. The decision to include these conditions emerged from the analysis of EPTs' writings and verbal comments during the first two years of the study.

The study is interpretive (Gallagher, 1991; Erickson, 1986; Eisner & Peshkin, 1990). Data for this study were constructed using students' written assignments (e.g., paper on power relationships, entries in their portfolio, comments on lesson plans) and their responses to semiformal and informal interviews. Over 90 formal responses to the power relationships in the lives of secondary science EPTs collected during the most recent two semesters were analyzed. In addition, more than 75 portfolio entries written by EPTs during the three years of the study and over 30 semi-formal interviews and 50 informal discussions with science EPTs regarding power relations added to the data construction and were part of the analysis. Five EPTs who were part of the secondary science methods courses were asked to verify developed patterns using the "hermeneutic cycle" (Guba & Lincoln, 1989). Evolving assertions were also verified using EPTs who were not

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part of the study. Their responses were taken into consideration for this final version of this analysis.

Data from different sources (papers written by EPTs analyzing power relationships in their environment, portfolio entries recognizing power relationships as critical elements for their teaching, informal and semi-formal interviews) and data collected using different techniques (written responses to assignments, interviews, spontaneous Emails) were contrasted constantly and assertions were modified using triangulation (Berg, 1989). Semi-formal interviews concentrated on clarifying statements made in the written assignments. Written statements were read and EPTs were asked to expand/clarify/modify their statement and provide support (reasoning, examples). As many schools in our servicing neighborhood employ more than one science EPT, I was lucky to collect various EPTs perspectives on their relationship with specific individuals such as principals, secretaries, parents, and superintendents. These different perspectives enriched the effect of triangulation.

The characters described in this paper are constructed from the many data sources described above according to the evolving patterns. Various stages of this study were discussed with class participants, and with non-participants. Results from various stages of interpretation were presented on various occasions (e.g., Moscovici & Li, 2001a, 2001b). The questions, reactions, and comments of all the individuals who reacted to the various stages of this study helped with the structure and issues addressed in this paper.

In order to preserve participants' anonymity, the names of the characters were changed.

Findings

Outside Conditions or Variables

EPTs throughout California are members of their bargaining units or unions, in some cases as fee payers. EPTs in the Los Angeles area pay their dues to the teachers' union; yet, in many districts they do not benefit from their payments, as the union can not defend their disputes/firing. Principals can fire EPTs without having to provide a reason. No due process is required unless the teacher has achieved probationary status (year two of an internship or a valid California credential). The salary of an EPT is lower than that of a certified teacher. EPTs have to accept classes that other teachers reject and they have the last pick because of their lack of status. Many times EPTs end up teaching a variety of classes from the low end of the student achievement spectrum, each one with its own curriculum to develop and implement. Another class for which the principal could not find a substitute teacher may fill their planning period, or, also because of lack of qualified teachers, on many occasions they are required to teach extra course hours. The only openings for them may be in year-round schools, over crowded and under resourced. During the school year they may have to accept students who are rejected by other veteran teachers.

EPT Analyses

It is interesting to underline that the EPTs themselves analyzed power relationships in their environment and provided me with the results of their analyses, as well as enough evidence in order to support their assertions. As a result of their own personal analyses, many of them had already changed their practices to encourage their students to participate in scientific inquiries and become skeptics.

Most of the EPTs were disturbed by the students' position on the power scale. Jane, a "woman of color" with three years of teaching experience in the inner city schools expressed her worry in the following way:

As a woman of color, I experience powerlessness on a regular basis. However, my students experience a sense of powerlessness and hopelessness that is much greater than mine. I teach life science at a school whose ethnic makeup are Hispanic, Black, and Samoan. All these three ethnic groups are socio-economically oppressed in the United States. My students live in neighborhoods with a very high crime rate; street gangs and police have the power to hurt, incarcerate, and even kill them at any time that they choose to. Their neighborhoods are poor, and they are the clients (and recipients) for second-hand education. In school, they have been trained from a very young age that they are at the bottom of the pyramid as far as power is concerned. A lot of their teachers abuse their authority over them by either verbally abusing them or by not holding them to a high standard. It is as if the teachers expect them to be less responsible than and not as intelligent as their affluent counterparts. A lot of teachers make their students either answer questions from the back of the book or watch videos every day. The students do not have the power to demand a better education. (JD3/01)

Jane's description supports Anyon's (1980, 1997) analysis of the education system for the working class. Students' resistance gets penalized in a drastic manner. It is not encouraged or even tolerated as it might be in affluent professional and executive elite classrooms. Working class students are punished rather than educated. Finn (1999) describes powerlessness as a dominant theme in the working class mentality. Individuals from the working class expect to be told what to do and when to do it by outside experts, and many of them are happy to just follow orders and conform to societal expectations. "It seems that our school system is designed to drum out every ounce of individuality and leadership from our young people," said Jane with sorrow.

The following findings are organized using Yukl's (1989) framework. Three types of secondary science EPTs teachers are described in this study: the dictator, the expert, and the political activist. The study explores the interaction between power and the need to infuse inquiry science teaching into our schools.

The Dictator

Joseph is a dictator. He uses his position power to the extreme. "I have the power of grade upon them. I have the power to call home and get them in trouble.

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If a situation arises when a teacher's word comes against a student's word, parents, administrators, and the other teachers always believe the teacher." Joseph is pleased to see that his desk has power without being there. Because his desk reflects his power, even if it is a TA sitting there, the TA has his power.

Sitting behind the teacher's desk, in the teacher's chair, represents an island of authority. It truly represents position power. I have student assistants for all my classes. They perform the typical duties such as delivering messages to teachers, escorting problematic students to the center, and acting as gophers. On occasion, when I am not in full view of my class, I will ask my TA to sit in my chair, observe the class, and write down the name of every student who is misbehaving. To the students, the TA by sitting in my chair represents the seat of authority and the TA will usually get full cooperation from the class. When I have asked the TA to stand in front of the class and perform the same task, the class did not cooperate in the same manner.

I keep my grade book on my desk. This also tends to verify that the desk and its surrounding area represent a position of great power. (SD2/01)

Joseph's classroom is very organized, all the students are sitting in their seats, and Joseph has full control as he can observe each and every one of the students from his desk. His position resembles Jeremy Bentham's "Panopticon" (in Shumway, 1989). The proposed prison architecture ensured full visibility of all prisoners' actions from a control tower situated in the middle. The prisoners could not know when they were observed and this fact ensured full control. Foucault suggests that this architectural principle can be observed in various situations, including schools: "All that is then needed is to put an overseer in the tower and place in each of the cells a lunatic, a patient, a convict, a worker or a schoolboy." (Foucault, 1980a, 147) In the case of Joseph's classroom, constant surveillance or its possibility allowed him full control from his slightly elevated desk.

Although he has taught science for three years, students in Joseph's classroom have never experienced inquiry science situations. Joseph's teaching is consistent with Anyon's education for the working class where control and following rules, worksheets geared toward recall and assignments that reinforce lower order thinking skills ensure the perpetuation of the *status quo*. His administrators appreciate Joseph; his classroom is always organized and students are in their seats busy and quietly doing some school-related work. Students recognize Joseph's position power and avoid conflicts. Working class education in Joseph's case could continue forever because of the tacit collaboration between its parts—the teacher, the students, school administration, and community.

Joseph's challenge came from the delight he experienced while being involved in inquiry science during the Science Methods course. After his analysis on power relationships in his classroom as related to the implementation of inquiry science, Joseph began opening up and encouraging small inquiries while sharing part of his position power with his students. During his electricity unit, Joseph had his students

build electric circuits with lemons and other unusual conductors. When the students asked him why the light bulb lighted up, he forwarded the question to the students. He provided reading materials, Internet resources, and let the students explore the “why” rather than supplying them with the answer. He left his desk and began listening to students’ “talk aloud” during investigations. His comments at the end of the unit were that he began enjoying students’ research capabilities and questions (“I did not know how bright these kids are!”), as well as their interest in this different kind of science, inquiry.

The Expert

Julie is in her fourth year of high school science teaching. She is well established in her school, and has full support from the administrators. She is puzzled by the attitude of the parents in her school community. When she mentions that she is the science teacher, most parents exclaim with admiration “Oh, the science teacher!” Some of them also add that they were never good in science during their schooling. Lemke (1990) talks about the public perception of science as a multitude of unquestionable facts describing an objective reality. The scientists or the gatekeepers of science belong to a special, elite minority of “intelligent people [who] can really understand it [science].” (139). Although the science teachers are not accepted by the scientists as part of the elite scientist minority, they are the representatives of science in the eyes of the general public. Recalling that science has its roots in “witchcraft” and the supernatural (Aicken, 1991), where there was a need to keep the public uninformed in order to keep the power, it is not surprising to see that science was and remains a “powerful” subject.

The parents value Julie’s expertise power (part of the personal power in Yukl’s framework). Her expertise power also intimidates her colleagues during department meetings—“We are admired just because of the data we must keep from leaking out of our brains,” she says. One teacher, when Julie was introduced as the high school chemistry teacher said in admiration: “Well, you’ve certainly already earned your wings to heaven.”

Julie understands that coming from working class homes, her students might also feel that knowing science implies that a person is some kind of a genius. As she surveys her entering students each year, she knows that these students come into her science class with many preconceptions and insecurities with respect to science as a subject as well as their ability to succeed. When they were asked “What is your greatest fear about science?,” they answered that they feared failing the course.

As a minority teacher teaching in an urban minority high school, Julie concentrates her efforts on encouraging her students to become science experts and share their scientific knowledge with parents, and other community representatives. For example, in her unit on chemicals and the water in our environment, she encouraged her students to research and document availability and concentrations of different solutes in waters collected over a semester. Her students learned to measure and predict the effects of low and high concentrations of solutes. They

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became the experts explaining the chemical profile of their water samples. Terms such as dissolved oxygen, phosphates, and nitrates became part of their every-day language. The depth and the quality of the students' research on water chemistry impressed parents.

Julie is using scientific inquiries as avenues for documented research and shows her students that scientific skepticism, tenacity, and responsibility are skills associated with expertise in science, and with higher order thinking skills that are necessary for survival in our ever-changing world. She teaches them that they can become science experts if they really place their energy into their science project.

The Political Activist

Steve is a member of the community where he teaches. For the last three years he has been involved in the community and he opens the doors of his science classroom to everyone interested. He nurtures political connections in order to improve students' visibility to their community leaders and their chances for success.

The trick of the trade is to accomplish every task which pleases the State, District, School Principal, Vice Principals, Department Head, parents, and students, all in one. It is a highly structured environment that nurtures a positive foundation [for classroom environment] and demands higher levels of thinking from my students (inquiry). Which, in turn, has become my foundation for success. Almost from the beginning my room has been a high contact area for all the levels of power mentioned previously. I have been interviewed by state representatives, parents have come for numerous observations, and I have had several dozens of teachers for fieldwork [for classroom observations]. . . . Challenge is the name of this story, not complaints, and I live for the adventure of improving the academic environment for my students and myself. (MJ2/01)

He is the pride of the principal when community politicians come to visit the school. They listen to Steve's students participate in science lessons, and see the quality of his students' projects all around the room. Students in Steve's classroom are able to show excitement connected to inquiry science without getting into behavior patterns that might be disruptive for learning. Challenges that students encounter during the various stages of inquiry are explored further and students understand that looking for scientific evidence to support claims is what good science is all about. They learn to become polite skeptics and challenge each other's findings and claims in a collegial manner.

For example, in one of his lessons, Steve asked the students to work in groups and figure out and be able to illustrate and explain the electron configuration of various atoms. One group was on the floor in the middle of the classroom. On their knees, students were discussing the placement of golf balls representing electrons on the various orbitals surrounding the nucleus of the element Argon. "My students are visual and kinesthetic learners. That is why they need to visualize and be able to manipulate materials in order to learn. They can not understand something that

they can not see. The groups had to figure out how many gulf balls they need, and also how to organize them around the nucleus.” Steve used their models and effective questioning techniques to explore with his students the history of Mendeleev’s table of elements and the most important commonalities and differences between the elements according to the atomic theory.

Why is Steve so special? Because he is able to show that a good science teacher can mold students with various disabilities into science inquirers. Steve is using political power to help his students learn science in a meaningful way. He is constantly using inquiry during science classes as he views inquiry as “a way of living. A mechanic, a nurse, a housewife, and a manager of a company, they all have to be inquirers and be able to solve problems. I teach them strategies how to overcome their areas of weakness. It is up to them to apply these strategies and succeed.”

Conclusions and Implications

This study reinforces the idea that as educators, we need to school the future generation of teachers to be able to analyze their teaching conditions, and, with the help of theoretical and practical ideas on teaching, make the necessary changes that will lead to improved students’ learning. Issues related to urban teaching, power relations in the life of a teacher, critical pedagogy, these should become topics addressed in every urban teacher education program as part of the creation of the transformative intellectuals (Giroux & Simon, 1989) who will shape the future.

Science teaching using inquiry and the recommendations from national and local institutions (National Research Council 1996, 2000; Minstrell & van Zee, 2000) will not happen if the Joseph(s) in our school system continue to be content and unchallenged in their working class educational system. Joseph’s decision to change his teaching practices and involve his students in some inquiry science will challenge working class norms in his school community. Is he going to receive the necessary support and be able to continue and enhance the quality of inquiry science in his classrooms? Or is he going to be punished because he had the courage to revolutionize the working class education system and successfully disequillibrated the *status quo*?

What will happen to all the pre-service and in-service science teachers who actually feel good being viewed as geniuses by parents, students, other teachers, and society in general? We all know many of these. They give only multiple choice tests and are pleased with students’ low scores. Furthermore, students are blamed for their inability to recall the “abstract” principles of science (Lemke, 1990). We have to trigger their conscience if we want them to become the kind of reflective teacher that Julie is. We need to show them that the kind of education that they provide will lead to an increase of working class non-thinkers rather than to the critical citizens that we need (Anyon, 1980; Finn, 1999).

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And how can we ensure that our pre-service and in-service teachers receive the necessary administrative and community support evident in Steve's school? We need to teach our EPTs the advantages of solid collaboration with the administration and community representatives.

What do Jane, Joseph, Julie, and Steve have in common? They now know the principles of urban education; studied issues of power relationships; they understood the roles of teachers and know about and apply recommendations regarding science teaching and learning; and they have all been involved in analyses of the various contexts of what they have learned. Having received an education in the many lenses for analyses, and having used them on numerous occasions has helped them see what was hidden previously. They have learned to be critical, felt disequilibrium, and changed their practices accordingly (Glaserfeld, 1989; Tobin, Tippins, & Gallard, 1994).

This study is the result of three years (six semesters) of intensive data collection and interpretation in an effort to understand the dynamic interaction between power relationships in the secondary science EPTs context of teaching and their use of inquiry in their classrooms. The number of EPTs who contributed in a variety of ways to this study surpasses 100. Their writings and verbal reaction added to the quality of this study. Emerging patterns related to the three sources of power—position, personal, and political (Yukl, 1989)—were verified constantly and additional data was collected when necessary. The dictator, the expert, and the political activist are three types of EPTs who use elements of different power sources in order to engage their students in inquiry science.

In conclusion, teaching and exploring power relationships in science teachers' lives is essential if we want the teachers to change their practices toward inquiry science.

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