
Title	Latent power in high school organic chemistry discourse
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Latent power in

High school organic chemistry discourse

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Abstract

This paper draws on Foucault to (a) *describe* the production of classroom discourse in relation to how ordering manifests within the discourse, and (b) to *explicate* how chemistry classroom discourses are not fixed but are the site of constant contestations of power as displayed in an eighty minute high school lesson on organic chemistry in Singapore. This microanalysis of discourse provides opportunities to reconstruct how teachers teach and dispels the notion that power is uniquely their sovereign possession. Classroom instruction is in fact a complex activity that coordinates power/knowledge production through communication. Examining classroom instruction through Foucaultian lenses uncovers the taken for granted nature of communication and illustrates the capillary relations of power and knowing.

Introduction

Classroom science is typically (re-)produced as an objective, privileged way of knowing pursued by intellectually able elites (Barton & Yang, 2000). Others have shown how it plays a major role in reproducing alienating meanings via classroom activities, discourse, and social organization (Lemke, 1990). Specifically, this culture of science is reproduced transmission models of instruction, boring, repetitive tasks (e.g., verification laboratory activities, drills and practices for memorization of facts), and a privileging of dry, technical-rational discourse over scientific literacy for all students. Without neglecting the institutional authority bestowed on the teacher, we additionally have to view teachers, students and the various communicative resources in the classroom as co-constituting power relationships. Because the latter are often latent and taken-for-granted, the task now falls on uncovering how these power relationships arise and are maintained from a Foucaultian perspective. As mentioned, displays of power in classrooms are better considered as manifestations of the *relations* between individuals and it is naive to conceive of power as residing in a single subject whose capacity of power has an effect on other subjects. This seems to make sense for new or beginning teachers for example do not automatically gain control over their classroom unless they prove to their students they are deserving of respect themselves or are allied with powerful individuals such as the school principal. Power and authority to speak and act are thus not givens but negotiated by various means, chief of which is classroom talk.

Because Foucault equated knowledge with power, the way has been paved for a robust social critique of how latent power relationships are realized through classroom discourse. Displays of power entails knowledge of science being produced in the classroom as power relation correlates with the making of a field of knowledge which simultaneously presuppose and constitute power relations (Foucault, 1977). In order to unravel this critical dialectic, we need to examine science classroom discourses where knowledge and power circulate and reinforce each other. Our choice of Foucault to study science classroom discourse derives from the link between a variety of processes that are local and mobile, which can operate at any point on the macro/micro continuum (Kendall & Wickham, 2004). As a result, it is possible to approach classroom discourse with the intent of conducting micro analysis of the relations of power between students, teacher and knowledge without being overwhelmed by the politics and governance exerted from external organizations that gave rise to the schooling institution. This is not to say that the latter are not important but that the micro-practice levels concretely reflect the timescales of these power plays most vividly. We explain our theoretical framing in greater detail in the next section.

Theoretical Framework

An introduction to Foucault is appropriate due to the shadowy presence of his contribution to science education. A philosopher who has written much on society through historicizing of supposedly universal categories like prisoners and mentally ill patients, Foucault asked questions of “how” and

“what” of power in society. By analyzing structures of human sciences as discursive systems and treating them as objects of study (Rabinow, 1984), traditional conceptions of power residing in sovereign power gives way to new form of power that lies within the members of society (Foucault, 1977). Power is thus derived from the social body rather than the ruler and this power that “endeavors to administer, optimize and multiply, subjecting the disciplinary power to precise controls and comprehensive regulations” (Foucault, 1980, pp. 137).

Power being a controversial term thus requires a definition and limitation of the boundaries of its application. The conception of power in this work is different from how the typical concept of power as an external force or institution or government that imposes on their subjects is perceived. For the purpose of this Foucauldian inspired work, power is view as a dialectical relationship between participants and it permeates the social network like blood capillaries in our body system.

Power is dispersed throughout social relations and results in production of possible forms of behavior as well as restricting behavior. For example in a classroom, the presence of the teacher normally results in production of student behavior like answering questions, reading notes and restricts behavior like walking out of the classroom unless permission is granted. Similarly the presence of students in a classroom triggers behavior from teachers that is formal and a teacher certainly does not talk the same way in the classroom as compared to conversing in the staff workroom with colleagues. Thus nobody possesses real power, but rather power is a fluidly embedded within relations between human beings and this notion can be delineated from a careful analysis of banal classroom practices.

According to Kendall and Wickham (2004), it is difficult to distil from Foucault's major works that spans multidisciplinary fields, a singular Foucaultian framework. His methods are seen as vague and out of the world. Yet, Foucault did encourage work with his ideas in new and creative ways (Mills, 2003). Thus rather than a direct application or over-generalization—twin evils to be avoided—this paper proposes that Foucault's ideas about power and discourse be utilized in the study of classroom discourse in the following manner.

Firstly, it is necessary to clarify that power relations are different from relationships of communication which transmit information by means of language and symbolic medium (Foucault, 1982). The production of meaning can result in the manifestation of power but both are not equivalent. There are three types of relation within the study are separate yet related. Their relationship is shown in the following diagram:

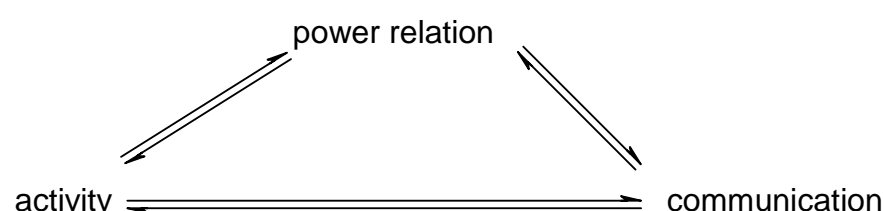


Figure 1: relationship between power, activity and communication

The three entities are not in an equal equilibrium and tipping the scale at any one entity has a cascading effect on the other two (Foucault, 1982). Power relations describe the action of men upon other subjects through the use of domination by means of constraints, inequality. While communication is about the production of meaning through signs, and reciprocity of the communicative act, activity refers to the transformation of the real through techniques that are perfected in the field of things.

Therefore, existence of power is not in a molar, concentrated form in Foucault's terms and it is present only when placed into action and is certainly not a mode of action that acts directly and immediately on others. Therefore an instruction of a teacher for a student to stand up is an exercise of power that is communicated via language and if the student stands up, power is said to have closed the door on other possibilities like the student raising his hands or vocalizing his displeasure at being singled out. Thus the exercise of power consists of guiding the possibility of conduct and putting in order the possible outcome (Dreyfus & Rabinow, 1982). This exercise of power can originate from the student and an example could be as shown from an excerpt of student-teacher (student and teacher has been renamed as S & T respectively in this work) conversation.

T: predict the difference between the two melting point.

S: fifty something

T: fifty something, sixty something. Now why?

S (Silence)

T: (look at students for 10 secs) now go back to your graphs, come on, go back to your workbooks. (teacher walks down from teaching platform towards students' bench)

In this situation, the silence of students prevents the teacher from continuing with the lesson on differences in physical properties between organic compounds and he has to implore his students to provide an explanation. Power resides in the silence of the students as it orders the learning situation by alerting the teacher about a possibility mismatch of knowledge as the students are unable to provide the expected answer. The action of the students upon the teacher obligates the provision of clues "go back to your graphs, go back to your workbooks" as a means to the end of providing an explanation.

The activity of making prediction requires the teacher to communicate through verbal language and students response through speech. However, power relations produce knowledge through the teacher's tweaking of the students' answer. Quickly transforming the students' response to ten degrees higher, the teacher leads the student to provide an explanation for his answer. This transformation demonstrates power to reside in the knowledge produced by the teacher. However, it also shows the passing of knowledge over to the students as they are requested to explain. Power seeps from the teacher to the students who offer resistance unknowingly as they are unable to produce mean meanings. This silence can thus be seen as residing in the classroom activity as well as a form of communication of the student and lastly the silence demonstrates the unequal relationship between teacher and students. In fact, these three types of relationship overlap one another, acting upon each other reciprocally as a means to an end.

Therefore, power, communication and activity are three types of relationship in dynamic movement which are not mutually exclusive. The coordination of these three types of relationships is "neither uniform nor constant" (Dreyfus & Rabinow, 1992, pp. 218) and to approach the theme of power in the classroom therefore requires a fundamental shift about the locus of power. The following sets out some key concepts underpinning the theoretical and analytic approach taken throughout this paper. They are broadly grouped under three main thematic headings: (1) classroom discourse, (2) relationship between power and discourse (3) available methods for analyzing this relationship.

(1) classroom discourse

Analysts of language have defined discourse in broad number of ways. Stubbs (1983) defined it as language above the sentence or above the clause while Fairclough (1992) suggests that discourse embraces language use seen as a type of social practice. However, discourse cannot be pinned down to one meaning due to its complex history (Mills, 2003), quoting from Foucault (1972, pp. 49):

Discourse is not a mere intersection of things and words: an obscure web of things.... I would like to show with precise examples that in analyzing discourses themselves...the emergence of a group of rules that define the ordering of objects... discourse are composed of signs, but what they do is more than use these signs to designate things. It is this more that renders them irreducible to the language and to speech. It is this "more" that we must reveal and describe.

Therefore, the use of signs carries with it historical baggage and more importantly, discourse is not restricted to how words are combined or expressed through speech. It entails meaning potential and constraints of practices that embodies meaning and social relationships (Ball, 1990). Foucault classifies discourse as a general domain of meaningful, oral or written utterance and that the individualizable group of statements is related to a certain discursive group. For example, emails of feuding friends contain written utterances that are meaningful between the communicating subjects and their unfriendly or even hostile statements can be grouped into a discursive group that identifies them as being enmeshed in a bitter relationship. Similarly in a science classroom, the speech of the teacher consists of oral and written utterances and the grouping of these utterances identify the discursive structure of scientific classroom discourse. Discourse is also viewed as a practice that 'systemically form the objects of which they speak' (Foucault, 1972, pp. 18). Thus discourse of a

particular practice affords and constrains the production of objects by defining a legitimate perspective of communication and fixing the norms for the elaboration of concepts (Pentzoid & Seidengianz, 2006).

(2) relationship between power and discourse

There is a need to clarify that power in Foucault's terms in a series of propositions. Power relations do not uphold equality for all members involved. Its mobility is localized spatially and temporally in everyday operations. In order to analyse relations, there is a need to isolate, identify and analyze the web of unequal relationships materialized at the level of "micropractices" (Dreyfus & Rabinow, 1982, pp. 185).

Through the use of discourse, a "nameless voice", its power and danger is at once controlled, selected and organized. This regulatory function of discourse is affirmed by Foucault (1972) as he discussed in detail how this regulatory function serve to determine what is acceptable by means of divergence of modes of argument, insufficiently addressing the objects spoken about, the incompatibility of concepts and the exclusion of options.

Foucault extends the conceptualization of power as a productive process rather than a repressive situation where power resides in institution and measurable in terms of the amount of physical, economical or political power. The concept of power is thus moved to every level of social activity in which power can be manifested by individuals and observable (Foucault, 1980). As a result, power is dynamic not static and is thus a complex and continuously evolving web of social and discursive relations (Thornborrow, 2002).

Through teacher talk in the classroom, the discourse of the teacher could be seen as a means through which knowledge manifest through the discourse of the teacher. It is a dynamic constitution of regimes of mechanism in their capillary form of existence (Foucault, 1980, pp. 39 cited in Pentzoid & Seidengianz, 2006). This web like manifestation of knowledge through discourse of the teacher results from the production of every single statement. For example at the onset of a lesson, the teacher engages in 'housekeeping' discourse as shown:

T: The green workbook you can leave it at the home. I am not going to use it anymore. From today onwards, you are going to bring the orange workbook and I am going to use it for the whole of term 3. Organic chemistry is the last part of our syllabus. Are you clear? (Walks up and down the aisle, watching his students)

The knowledge of 'what's best' for the students is constituted by the teacher in speech as he organizes the students behaviour. This mechanism articulated by speech controls the types of books students bring for future lessons. As the presence of students exercises power over the teacher who is obligated to teach science, it is noted that teacher justifies his words by commenting that organic chemistry is the last part of his syllabus for the students which ties up neatly with the use of the orange workbook for the remaining term. Therefore, as the teacher verbalizes, he is subjugated by his own wealth of scientific knowledge which endows him with the ability to teach as well as his 'scientifically helpless' students whom he has to teach. Thus it is not the domination of the teacher over his students but rather power is employed and exercised through a net like organization in which the subjects are simultaneously in the position of undergoing and exercising power.

(3) methods of analyzing this relationship

Foucault offers a possible method for the study of human beings and to diagnose the current situation of our science classrooms. The merits of Foucault's work lies in his attempt to delineate through a variety of examples a multifaceted interpretation of the structure and intent of modern social arrangements (Roth, 1992). With a unique emphasis on the body as the place in which the most minute and local social practices are linked up with the large scale organization of power (Dreyfus & Rabinow, 1982, pp. xxii), we thus focus attention on the teacher who tries to increase the ability/knowledge of his students through classroom talk.

Previous works by Ryan (1991) unpacked Foucault's ideas and applied them to an understanding of a specific educational practice and concluded that as long as schools continue to use an organizational scheme geared to watching, testing and normalizing students, their efforts to reduce inequality were bound to fail. While participant structures in terms of power analysis has been

performed (Cornelius & Herrenkohl, 2004) and found that power is transformed when students are given opportunities to actively engage in learning, it has not provided concrete solutions for teachers in the organization of participants in the classroom learning environment.

Gore (2002) draws upon a Foucaultian framework to analyse power in pedagogy and suggests that power manifests through pedagogy which proceeds through a limited set of specific techniques. The enactment of power is typically on localised bodies of the subjects. Her work involves coding observational data based on Foucault's ideas on micro-level techniques of power enacted in institutionalised and non institutionalized sites. However, with the lack of concrete details of how pedagogy is characterized by power relations, educators are not offered any practical hints on how to strive towards more satisfying classroom practice" (Gore, 2002, pp. 8).

A way to proceed is to take resistance as a "chemical catalyst so as to bring to light power relations, locate their position, find out their point of application and the methods used" (Foucault, 1982, pp.211). Therefore, in order to understand what power relations are about, there is perhaps a need to investigate the forms of resistance and attempts made to dissociate there relations. Translating this idea to the classroom, resistance against the teachers by the students can be taken as one form of resistance and teacher's resistance against his students could be taken as another. From these forms of resistance, further attempts can be made to explicate power relations within the classroom.

Through the technique of historical analysis, Foucault described how space, time and surveillance are used inculcate new forms of knowledge. Through the transformation of individuals through classificatory procedures, they are lead through coercion to a range of behaviors that are designated as normal and culminating into self control (Roth, 1992). Foucault detailed the effects of space, time surveillance most saliently through the example of Panopticon where an imaginary building consisting individual cells arranged around a single tower standing at the center of an inner courtyard induced a state of consciousness and permanent visibility that assures the automatic functioning of power on each lone occupant of the cell. With little concrete examples of how this power is played out between the single tower of control and the inmates in the the Panopticon, Warwick and Kaiser (2005) argues that this is an underdeveloped but most interesting aspects of Foucault's account of the new disciplinary regimes installed in educational institutions. They suggested that the mechanisms control goes beyond the effect of coercing and subjugating of subjects but rather to seek capacities and aptitudes in the subject's body that could be enhanced and utilized.

Therefore, this work aims to regard the discipline of power as a positive economy through which subtle acts of mechanisms that produce docility and utility are co-produced in the individual. As a result, the productive capacity of the student can be increased through "extracting from time, ever more available moments and from each moment, ever more useful forces." (Foucault, 1972, pp. 137, 154, 159).

Objectives

This work is concerned with the micro analysis of one of the fundamental knowledge-producing sites in educational systems--the classroom (Kendall & Wickham, 1999). Specifically we examine the science classroom where knowledge is produced through a myriad of discursive and non-linguistic resources (Kress, Jewitt, Ogborn, & Tsatsarelis, 2001). This contrasts strongly with more traditional classroom where transmission of knowledge has been problematized as being monologic (Alexander, 2005). Being a resource for meaning making, language in monologic situations can affect learners' perception of speaker's credibility, persuasiveness and authority (Bradac & Giles, 2005). Therefore, classroom talk mediates not just teaching and learning but also the wider culture (Daniels, 2001, pp. 12 cited in Alexander, 2005). By taking a look at a seemingly neutral act of teaching high school organic chemistry, this can provide a new frame to understand classroom culture and power. While it is not the intention of this work to be entangled with the deeper meanings and exposition on culture, it is necessary to acknowledge the presence of a localized classroom culture as the teacher and student go about ordering their world within these boundaries which has an implication on how knowledge is being produced.

The primary goal of this paper is to analyze classroom discourse using Foucault's ideas of power and discourse. In order to examine the role of power in discourse it is necessary to examine

how members of society who possess it, reflect, reinforce and reproduce it through talk. To do this, we examine the discourse practices of teachers for they typically employ greater use of language.

In what follows, we (a) *describe* the production of classroom discourse in relation to how ordering manifests within the discourse, and (b) to *explicate* how chemistry classroom discourse are not fixed but are the site of constant contestations of power. This account relies heavily on the notion of *ordering* as an organizing principle for classroom discourse. A critical investigation into the main idea of power requires this paper to pose the following research question: by what means is power exercised in the classroom? What happens when individuals exert power over others in the classroom? This paper is thus interested to formulate a praxis that involves fundamental shifts in formation of subjects in educational institutions.

Methods & Data sources

Foucault does not posit himself to offer any concrete methodological framework for analysis and in his discussion on discourse, there is no advice on how to engage in discourse analysis except for vague notions that discourse be treated as and when it occurs (Foucault, 1972). In the absence of a method, guidelines are provided to illuminate the possibility of discourse analysis:

1. Suspension of pre-existing forms of continuity that are typically accepted without question
2. Tranquillity of manifested discourse must be disturbed
3. Scrutinise the justifications of manifested discourse
4. Define in what conditions and in view of which analyses are the manifested discourses legitimate.

Roth (1992) suggests that it risky to apply Foucault's ideas in investigating pedagogical practise and institutions as it involves perpetual uncertainty about the fabrication of knowledge and power. However, just as Foucault had identified specific sites in which rituals of power take place: the Panopticon of Bentham in *Discipline and Punish* and the confessional in *The History of Sexuality*, which has innovatively illuminated the connections between knowledge, language and action. This work will use thus use the classroom to localize and specify how power works, what it does and how it does it in an attempt to ruffle the fabric that governs the way teachers teach and students learn within the classroom.

Adapting Kendall & Wickham (1999, pp. 144) suggestion on how to use Foucault's ideas in the analysis of discourse, the following approach will be used for the analysis of an eighty minute high school chemistry classroom discourse produced by a male teacher and his class of forty students engaged in the learning of introductory organic chemistry. A Foucaultian research requires: (a) 'how' questions, (b) a decision about an appropriate archive for investigation, (c) a preference for programmatic texts, and (d) the commitment to keep digging until one finds the relative beginnings of a practice

Findings

In order to *describe* the production of classroom talk in relation to how ordering manifests within the discourse, it is necessary to present the ordering of knowledge from the way the teacher structure his discourse during the eighty minutes lesson. An almost rhythmic pattern of recall-teach-summary was present in his classroom that functions to allow the teacher to teach the scientific concepts.

Table 1: structuring of organic chemistry lesson

Time interval	Subtopic	Function of interval	Rhythmic pattern
00:00-1:54	Homologous series identification	Recap of previous lesson	Recall
1:54-2:57	Homologous series definition explanation	Students reading & teacher explains	Teaching of concept
2:57-4:20	Convention of naming	Teacher verbally tests students	Teaching of concept

4:20-5:00	Rules of drawing	Refers to students' text	Teaching of concept
5:00-6:29	Alkane introduction	Methane example	Recall
6:29-10:05	General formula of alkane	Applying maths to derive formula	Teaching of concept
10:05-18:10	melting & boiling point	Abstract concept 1	Teaching of concept
18:10-18:38	Solubility	Abstract concept 2	Teaching of concept
18:38-21:55	Viscosity	Abstract concept 3	Teaching of concept
21:55-23:05	Flammability	Abstract concept 4	Teaching of concept
23:05-25:58	Trends of physical properties	Relationship between abstract concepts 1-4.	Teaching of concept
25:58-27:38	Practice question	Easiness of organic chem.	Summary
27:38-29:07	Chemical properties:unreactive	Abstract concept 5	Recall
29:07-40:05	Combustion	Abstract concept 6	Teaching of concept
40:05-54:37	Consolidation	Application of abstract concept 5-6	Summary
54:37-01:07:54	Substitution	Abstract concept 7	Teaching of concept
01:07:54-01:20:23	Consolidation	Application of abstract concept 5-7	Summary

The notion of ordering as an organizing principle for the teacher's lesson may resemble that of running the classroom like a production line where simpler concepts are taught first before difficult concepts that require assembly of previous concepts are discussed. This direct teaching method (Rosenshine & Meister, 1996) resonates with the idea that the productive capacity of the student is accelerated and enhanced through the ordering in the exposition of knowledge and the teacher is able to extract from time, ever more available moments and from each moment, ever more useful forces (Foucault, 1977).

From the data above, the teacher extracts from moments of teaching abstract concept 1-4, an available moment to generate more useful forces by focusing the attention of the students on the relationship between the abstract concepts at time 23:05. It may be suggested that having knowledge of the individual abstract concepts incites a further engagement with knowledge by focusing on the deeper relationship between concepts. This is thus an example of how power can exist in circulation as it produces local effects, inducing the formation of particular knowledge that induce a range of possible responses (Barker, 1998). Where the teacher could have moved on to talk about abstract concept 5 at time 27:38, this possible response is constrained by the hold of knowledge over the teacher who is obliged to help his students link the first four abstract concepts.

During the time of 10:05 to 25:58, teacher talk predominates and the structuring of verbal discourse can be seen as a mere organization act of the teacher. However, a power analysis of this simple activity of organizing content knowledge during the teaching process as shown from the brief description above illustrates the activity to be bound by power relations. Knowledge sets up power relation between the teacher and students, with power conferred upon the teacher when he talks about chemistry, the classroom activity shifts the equilibrium towards the communication of knowledge where students are placed in a powerless position. The mechanisms of power in its "capillary form of existence" (Foucault, 1980, pp. 39) extends invisibly through the communicative act of the teacher. Through making the choice of starting the lesson with the aim to teach students how to identify homologous series, power relation is set up and the choice of teaching is restricted. It would be unimaginable if the teacher goes off tangent to talk about inorganic chemistry and thus power/knowledge places a grip on subsequent permissible knowledge to be taught.

Students have no prior knowledge about homologous series and learning the technique of identification allows the action of teacher to be directly upon the students. Paired up in the activity of perfecting a technique, production of meaning by teacher is reciprocated by students with their attentive ears. This power of knowledge/teacher discourse reaches into the bodies of the students and inserts into their action and attitudes which is visible as students follow teacher's instruction to read their workbooks when the definition of homologous series is explained at the later part of the lesson.

Ordering through coherence of speech and the use of visual resources whenever necessary is present as we move into an analysis of an interval. For example in the following excerpt of the teacher teaching about viscosity of alkane compounds:

1. T: which one of you think is the most difficult to flow?
2. S: butane
3. T: butane? Why?
4. S: (silence)
5. T: let's assume they are all liquid. Why do you think it is butane?
6. S1: large one more difficult to flow
7. T: (addresses the whole class)what do you mean by the large one is more difficult to flow?
8. T: S2 did you say something? Heavy? The answer is heavy. What else? Any other possible reasons quick! Ok, let us just imagine someone that is not very...
9. S3: Val
10. T: (laughs) not just very skinny compared to someone who is skinnier, who tends to roll faster? Who runs faster? The obese one, not that I am saying Val, or not obese one?
11. S: obese
12. T: the obese one. So the larger your molecule, as it flows, it tend to get entangled up, because they have a lot of bonds, am I right? So as it flow, the bonds tend to get entangled up, so it slows down the flowing. But the smaller molecule will have no such problem, so it will flow very very fast. Are you clear now? Any questions? And that is what we call viscosity.

The above is an example of the ongoing statements that are produced in the classroom. Ordering of knowledge through question and answer allows the teacher to communicate the main ideas about viscosity which is also tied to power relations which consist of obligatory tasks of responding to students' silence as well as their answers. Power relations in this discussion are fluid as it is shared between teacher and students. The teacher possess the knowledge but withholds it till line 12, students possess answers to teacher's questions which demonstrate their knowledge.

The equilibrium between the participants in the above transcript can also be studied as being catalysed by resistance of the students. Silence in line 4 could be read as students not knowing the answer and therefore chose to keep quiet which allows them to retain power which could all be easily lost if someone in the class blurts out an irrelevant answer. This quiet demonstration of resistance catalyses a reaction that shifts power rapidly to the teacher. The teacher proceeds to lay out the assumption hidden in his previous question, rephrasing at line 5 resets the power equilibrium to tilt towards the teacher.

It is worth commenting at this point that this is not an attempt to generalize the ordering that may be present in other intervals of this teaching episode as it certainly does not agree with Foucault's notion that complexity of events can be simplified by into a dialectical relationship of cause and effect (Kendall & Wickham, 1999).

To *explicate* how chemistry classroom discourse are not fixed but are the site of constant contestation of power, one example discussed below:

Table 2: Movement of power relation hidden in speech

Time (10:13-10:50)	Speech transcription	Define conditions in which discursive strategies are used
1	T: ok I am going to grossly exaggerate this so that you get the concept right.	Setting up an unequal power relation
2	T: Alright!	
3	T: let us just imagine the marbles that I am going to show you.	Remove resistance of students by coercing them to imagine together. Claiming back some power
4	T: The larger one is butane and the smaller one is ethane.	
5	T: Is it alright?	
6	T: This is my butane and these are my ethane molecules.	Claiming full power by perfecting the answers of students
7	T: Any problem?	
8	T: Can you recall, this is butane molecules, what exist between them?	
9	T: What forces?	
10	S: (chorus) van der waals	
11	T: Weak van der waals forces	
12	S: weak van der waals forces (T repeats together with students)	

The operation of institutionalized training relies not just on the manipulation of the student body as shown in the data but also on the field of knowledge to be taught (Foucault, 1972, pp.149-152). Firstly manipulation may not be physical, but through the anchoring of knowledge of the analogy of physical objects as representations of abstract chemical compounds, the teacher attempts to facilitate the learning of the student. This operation can be read as a contest for power by the teacher. The teacher's speech is being analysed by his students as they listen to him and with the use of pronouns that marks out asymmetrical classroom talk and interrogative questions, power relation is set up that enables teacher to be perceived by the students as powerful. Use of pronouns 'I, You' marks out asymmetrical instructional talk, coupled with attention seeking markers 'alright, ok' to gain students' attention in line 1 and 2, the teacher prepares to illustrate the concept of chemical bonding between alkane molecules with analogies. The option for students to create their own analogies is closed as the teacher justifies his choice of illustration to be an attempt to help the students 'get the concept right'.

From line 3 to 5, it is interesting to note the inclusion of students with the pronoun 'us' and politeness 'is it alright?' serves to reduce previous asymmetrical instructional talk, this can be read as an attempt to place students at the same level as the teacher. This is necessary in order for the larger teaching agenda to operate successfully. The use of analogy not only serves as instruments of thought, it can facilitate persuasion as well as function to create perceptions of communicators (Bradac & Giles, 2005). Thus the choice of teaching resources (use of physical models), methods of inquiry (questioning technique) places the teacher at a position of producing knowledge which lends power to his role as a science teacher. It may be suggested that at this point of discourse, power is temporary shifted towards the students, persuading the students to think along the same trajectory, resistance by students to tangent away from the argument of the teacher is removed and this enables the teacher to proceed to teach without any visible resistance from the students.

The teacher has no ability to determine the thoughts of the students which are internal and potent sources of resistance against the power/knowledge of the teacher and attempts are made to wrestle back some power from the students from line 6 to 9. As the communicative process in line 3 to 5 have vested power upon the students and the teacher shifts the equilibrium back by claiming back authority through reiterating the identity of chemical compounds and resist or prevents any attempt by the students to have control over his act by questioning successively from line 7 to 9.

The field of knowledge in the above example is about the abstract forces of interaction between organic molecules and it also operates to train the students. Limiting students' responses through rapid speech (forty seconds to focus on interaction between organic compounds) and the gradual revelation of abstract knowledge can be seen as a form of control that the teacher exercises

over the students. In the name of learning science, students are trained to think in abstraction and even provide answers that are understood only by the scientifically educated community. Therefore, the above table sheds light on how the smallest component in the field of knowledge (interaction between molecules) is built upon through the initiation of the construction of a student's understanding and this starts from the body (students) as an object to be manipulated through the teaching process which is the key to disciplinary power (Dreyfus & Rabinow, 1982).

Implications

Our findings reveal the chemistry teacher to employ a few types of physical models, for examples, marbles to represent chemical molecules, glue to represent fluidity of organic liquid, to illustrate concepts in efficient manners. Ideas of students are controlled as they have only to focus on the few types of physical models used in class and the teacher marks important knowledge by grabbing physical objects which students can relate to. Besides the use of these models, the submission of bodies through the control of ideas was also evident from the questions that the teacher asked. Mostly questions that require monosyllabic answers, students' answers are restricted and presupposed by the type of questions asked. This reiterates the idea of dynamic equilibrium between power, activity and communication and reinforces the invisible existence of power that resides in our everyday classroom practices. Thus, seemingly natural obvious ways of teaching which can be attributed to teacher competency in handling content knowledge when analysed with the lenses of Foucault, is actually the effect of a number of choices that have been made in respect of how power relations constitute the knowledge and participants of discourse.

It is vital to also emphasize that these patterns of classroom discourse is the production network where power is both produced and resisted. Even though the sequence structuring of lesson and communicative style of the teacher can seem to approach the students as objects to be analyzed and separated into constituent parts with the aim of forging a docile body that may be subjected, used, transformed and improved (Foucault, 1977), it is noted that resistance is not absent from the process as students raise questions when the teacher do pause or when they simply kept their silence to retain whatever shreds of power that may still be in their hands.

Conclusion

This work improves our understanding of our everyday teaching practices which is overlooked by educational practitioners but which they would recognize if it were made salient. This paper has put Foucault to good use in education which requires surveying the closure and repetitiveness of instructional pedagogy. Alerting us to the processes of training and the relationship between the minute specific training regimes and their ability to locate, develop and exploit the capabilities of the individual, this paper hopes to have capture aspects of power and knowledge that are normally masked (Marshall, 1996). Although this study does not offer instructional pedagogy for teachers to apply in the classroom, it draws attention to the profound effects that teachers may exert on their students learning.

The teacher is enlisted into the essence of disciplined training where there is a need to find an optimal balance between the aptitudes of students, a daily routine of organized study and a pedagogically construed field of knowledge (Warwick & Kaiser, 2005). Approaching classroom discourse through lenses of Foucault reveals the work of the teaching in the classroom to be an activity that the teacher is not directly aware of and yet one that is essential to understanding the meaning of his activity.

The process where students learn how to speak and act as scientists does not come as second nature to the students and they have to be subjected to distinct institutional and intellectual traditions that unfold across time and space in order to be competent scientists capable of production of scientific knowledge. This work thus throws classroom discourse into the complexity and productive power of training. Through the description of how chemistry classroom discourse can be ordering in order for power/knowledge to be produced, this approach may constitute a potent resource for writing a pedagogical history of classroom discourse and position training as a general mechanism for the active production of the educated person (Levinson, Foley, & Holland, 1996).

This paper concludes that examining scientific classroom discourse through the lens of Foucault affords us the possibility of questioning the taken for granted nature of communication in our

local classrooms and provides an alternate viewpoint towards the manifestation of classroom power and knowing.

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