Title	"We 'Own' the teachers": Understanding subcultures of Singapore lower track science classrooms
Author(s)	Teo Tang Wee, Tan Aik-Ling and Yeo Leck Wee

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PROJECT CLOSURE REPORT

"We 'Own' the Teachers": Understanding Subcultures of Singapore Lower Track Science Classrooms

By

Teo Tang Wee, Tan Aik Ling, Yeo Leck Wee

National Institute of Education
Singapore

EXECUTIVE SUMMARY

INTRODUCTION/BACKGROUND

Subcultures emerge from within dominant and mainstream cultures and exert influence on the outcomes of science teaching and learning. This project is an explanatory study about the subcultures of a Singapore lower track science classroom with the aim to understand the sets of understandings, behaviours and artefacts used by lower progress students. This study was inspired by the students in the lower track classroom who shared that they would "own" the teacher and that this term was something that only they would understand (Teo, Badron, & Tan, 2017; projected under OER 51/12 TWT lead by the PI of this grant. The use of the word "own" did not make sense to us. According to a student, he and his friends would use the word "own" to mean they had overtaken the authority of teachers. In that project, observation of many science lessons in eight Normal Academic (NA) and Normal Technical (NT) science classrooms over two years, alluded to the presence of subcultures in the lower track classrooms. Subculture is defined as:

> A relatively diffuse social network having a shared identity, distinctive meanings around certain ideas, practices, and objects, and a sense of marginalization from or resistance to a perceived "conventional" society. (Haenfler, 2014, p. 16)

As compared to dominant and mainstream classroom cultures imposed and reinforced by teachers, subcultures may sometimes seem weird, childish, untamed or silly. Hence, subcultures are seldom taken seriously and deemed to disappear as the students mature. Subcultures, however, have ushered in generations of adolescents into adulthood, providing affirming spaces for students who might otherwise feel marginalized among their peers. Subcultures also foster non-normative values that they often take with them as they grow. Sometimes, teachers may just forget how brutal secondary school education can be on students who undergo identity crisis, struggle to learn the canonical science jargons, and do not fit in. The appreciation and understanding of subcultures in science classrooms, however, is poor and this could be in part, due to two reasons.

First, schools and classrooms are traditionally places where teachers command authority in deciding the rules, regulations and routines. Subcultures (e.g., punk and cosplay) are often stereotypically associated with deviant practices, behaviours and thinking. Subcultures can be misconceived as the opposing undercurrents that intentionally contest the norms for the sake of doing it. This view renders the understanding of subculture as unimportant or something to be eradicated rather than understood and used to inform curriculum decisions.

Second, the current science education literature is picking up on cultural studies, with the *Cultural Studies of Science Education* journal devoted to this genre of work. However, most of the studies discussed cultures as though they represent the mainstream cultures of the context. But what if the cultures are, in fact, subcultures, which emerge from mainstream cultures and interact with the latter? How would our interpretations of cultures? A more nuanced approach to doing cultural studies in science education is needed to push the frontiers of this important field of work. In our work, we take the position that rather to deny or dismiss the existence of subcultures or contest them in power struggles with students, it is worthwhile for teachers to understand how it plays out in the science classroom to shape the outcomes of teaching and learning. Rather than causing problems, subcultures often provide solutions to children in the form of a meaningful community (Haenfler, 2014). Below, we summarise a few key points about subculture:

1. Subcultures are dependent on a milieu of beliefs and practices.
2. There is variability in the culture of the group.
3. Subcultures are regarded as non-homogenous and non-static systems.

4. Subcultures not only focus on values, worldviews, themes or folk ideas as these do not exhaust cultural content.
5. The response of the community can play a role in creating subcultures by bringing similar groups into contact.

Similar to the term "culture" (Baldwin, Faulkner, Hecht, & Lindsley, 2006), "subculture" is a nebulous term. Hence, it would not be possible or justifiable to pin-point the subculture of a class simply because it can be defined in many ways. This study focuses on the subculture of "owning". During the study, we learned from the students that this practice (if you will call it) is something that resonated with most (if not all) NA students.

STATEMENT OF PROBLEMS

One of the goals of this study was to develop explanations for some of the phenomena we have observed in the NA science classrooms during our two-year study in the NIE Project OER 51/12 TWT. Specifically, we noticed the ongoing contestations between the teachers and students in the four NA science classrooms in two schools. There were different degrees of power struggles but generally, in all four classes, we saw the teachers trying very hard to deliver the lessons amidst the student resistance (Boren, 2001; Giroux, 1983; McFarland, 2001), both quiet and outward display, to learn.

Based on our microanalysis of sampled 24 classroom videos from four NA and four NT case study classrooms in the project OER 51/12 TWT, 18 per cent of the total curriculum time was spent on disciplining students. In addition to the qualitative data drawn from case study classrooms and schools, our quantitative study of 4,582 Secondary 1 and 2 NA and NT students from 39 mainstream and co-ed Singapore schools showed that the all four groups of students showed a decrease in science inference skills during the academic year 2014 (Teo, Goh, Khin, & Yeo, 2018). The results alluded to the lack of emphasis on developing science inference (process) skills in the science classrooms. Teachers could be struggling to keep up with classroom discipline and hence, devoted more time to content delivery than process skills. In sum, our hypothesis is that there are subcultures in the lower track science classrooms shaping the phenomena that we observed. In this study, we analyse subculture, and how it is interpreted and manifested in a lower track science classroom through the interactions of the students and teachers. The findings can offer science teachers insights that illuminate the complex and dynamic forces that interplay with their science teaching, so that they can understand and *work with*, rather than *against* student agency.

PURPOSE OF STUDY

We studied the subcultures of lower progress students with the aim to understand the sets of understandings, behaviours and artefacts used by these students. The research questions we want to address in this study are:
1. What is/are the subculture(s) of Singapore Normal Academic science classrooms?
2. How do(es) subculture(s) form in Singapore Normal Academic science classrooms?
3. How do(es) subcultures affect science teaching and learning in Singapore Normal Academic science classrooms?

PARTICIPANTS

The study was conducted in a Secondary 2 NA science classroom. The science lessons were taught by two science teachers who took turns to teach different topics. One teacher, Mr Lim, was a beginning teacher. The other science teacher, Mrs Tan, was an experienced teacher. We also interviewed the School Principal to find out about the school

culture. Participation in this study was voluntary; consent and/or assent forms were obtained prior to the start of the data collection.

METHODOLOGY / DESIGN

Data collection included lesson videos and interviews (refer to Appendix C for interview protocols) with the school principal, science teachers and students in one Secondary 2 NA class. A total of 12 lesson videos with evidence of "owning" were collected and each lesson duration was between 30-50 minutes. Each interview lasted between 30-60 minutes. The lesson videos and interviews were transcribed to address the respective research questions.

In the data analysis, we focused on the construct of "owning" as a defining characteristic of subculture in the case study class. This phenomenon was evident through their vivid and elaborate descriptions of the practice of "owning" during the interviews and classroom interactions. As such, "owning" form the focus of our analysis of subculture. In analysing the interviews, we focused on the definitions of "owning", different forms of "owning", different terms related to "owning", and so on. This set of data was used to address Research Question 1.

In the analysis of the lesson videos, we adopted event-oriented inquiry (Tobin, 2014) in identifying significant episodes that illustrated "owning" at play during the lesson. These lessons were transcribed and then analysed further for nature of the power relationships. In our analysis, we situated such significant episodes within the larger school culture of care and academic achievement (from the Principal interview) and hence, unpacked the power relationships as situated within these two elements of the school cultures to address Research Question 2.

To address Research Question 3, we viewed all the lesson videos and selected one episode to illustrate "owning" and how the teacher attended to it. It should be noted that the purpose of this case study is not to generalise the findings. Hence, the data were selectively analysed to provide an in-depth analysis and illustration of the subculture in the class. To ensure that research validity is obtained, the researchers, one teacher (Mr Lim), and research consultant discussed at length on the construct of "owning". The research consultant and researchers coded the interview data collectively. The coded data were then subsequently used to agree upon the selected episodes on "owning" and analysed further.

FINDINGS / RESULTS

According to the teacher and students, words similar to "own" include "got", "burn", "roasting", "savage", "wrecked", "dissing" and "flaming". The words differ in terms of the intensity of the "owning". For example, "got" is less hurtful than "wrecking" or "dissing". However, it is not clear that the students understood the nuances in the different words. "owning" has been defined in the following ways by the students. According to them, "owning" could be about: (1) creating a situation which does not allow the person being owned to respond, (2) making fun of others, (3) humiliating or outsmarting others, and (4) retaliating or taking revenge on another person. The different sources of "owning" include media (e.g., stand-up comedy).

There are many conditions for "owning" to be successful. The person(s) at the receiving end of "owning" should be someone who can quickly talk back, respond, or retort. According to students, this person should be "kind", "calm", "jokes", can be "outsmart easily by others", and/or "not witty". The exchange should be "rude but not rude", is "context-dependent", allows for "making mistakes" and evokes "retaliation". What this means is that the degree of "owning", and whether it would escalate to more aggravated forms, depends on the intent of the initiator who starts the process, the receptiveness of the receiver, the intent of the "owning", the place (space, timing, context), and position (relative to others and contexts) when "owning" happens.

The qualities of owning can differ a lot. It could be something that everyone can relate to and not personal. The tone and context is important for evaluating the intent and whether everyone is "in on" the joke. "Owning" typically takes place with at least two parties (comprising individuals or groups of individuals) and an audience. During "owning" the audience and parties participate in evaluating the "own" that was meted out.

To win an "own", the player should be fast, is able to make a quick and good comeback, quick-witted, outgoing, bold and bubbly. To win the "own", what is said or expressed must be understood by most if not all people involved. The person must outsmart others. In not responding, flustering, or denying the "own", one loses.

The subculture of owning illuminates the power play between the teachers and students during the science lessons. The subculture of "owning" had effect on how science teaching and learning took place in the classroom.

CONTRIBUTIONS

The existing literature focusing on lower progress learners in Singapore mostly adopt post-positivist and constructivist approaches to studying lower progress learners. Current studies of subcultures are situated within societies. This study has contributed to a better understanding of subcultures within education context. Two aspects of subcultures that are gleaned from the study are: (1) subcultures is shaped by power play of social agents, and (2) subculture is aggregative and not individualistic.

"Owning" is a not child's play. Rather it is a purposeful practice in the subculture of the lower track science classroom. There are limits to how far one should take a game. This study has contributions to practice: (1) science teachers should be aware of the games that students play and understand them, and (2) efforts to manage owning should be handled prudently, that is, teachers should not try to be "one of the kids".

CONCLUSION

We have provided an in-depth discussion of the subculture of "owning" in a Singapore Normal Academic classroom. Specifically, we have identified the different terminologies and definitions of "owning", sources of "owning", conditions for successful "owning", qualities of "owning", ways to win the "own", the value of "owning", and the limits to "owning". Subcultures form through the interplay of power relationships in the classroom. The power relationships may be teacher-dominated, student-dominated, or balanced. Here, we have analysed how power relationships work in the context of the dominant school culture of care and academic achievement espoused by the School Principal. Further discussions of how the subculture of "owning" impact science teaching and learning were offered. Implications for theory building of subculture and practice were provided.

ACKNOWLEDGEMENTS

KEYWORDS

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Teo Tang Wee, Tan Aik Ling, Yeo Leck Wee

National Institute of Education

INTRODUCTION/BACKGROUND

> Teacher: His [Nelson, a student in the class] presence has affected how you guys learn in class also right?
> Wendy [student]: Actually even if we tell him he [Nelson] won't change.
> Teck Yong [sudent]: He likes to own teacher.
> Researcher: He likes to "what" teacher?
> Wendy: Own.
> Teck Yong: Own.
> Researcher: "Own teacher"? What do you mean?
> Teck Yong: For example, he [Teacher] says something wrong, like "testes", then he [Nelson] keeps on [saying] "testes testes". Keep on own teacher.
> [Wendy notices the Teacher looking confused.]
> Wendy: This one [referring to the word "own"] only we understand lah.

Subcultures emerge from within dominant and mainstream cultures and exert influence on the outcomes of science teaching and learning. This project is an explanatory study about the subcultures of a Singapore lower track science class with the aim to understand the sets of understandings, behaviours and artefacts used by lower progress students, and diffused through interlocking group networks. The opening excerpt is taken from a cogenerative dialogue session (Teo, Badron, & Tan, 2017) with three Normal track students, their science teacher, an Allied Educator and three researchers in an OER funded project (OER 51/12 TWT) lead by the PI of this grant. Clearly, the use of the word "own" did not make sense. According to the student, his friends and him would use the word "own" to mean they had overtaken the authority of teachers. This episode, and several others drawn from observing many science lessons in eight Normal Academic (NA) and Normal Technical (NT) science classrooms in two case study schools for two years, alluded to the presence of subcultures in the lower track classrooms. Subculture is defined as:

A relatively diffuse social network having a shared identity, distinctive meanings around certain ideas, practices, and objects, and a sense of marginalization from or resistance to a perceived "conventional" society. (Haenfler, 2014, p. 16)

Why study subcultures

As compared to dominant and mainstream classroom cultures imposed and reinforced by teachers, subcultures may sometimes seem weird, childish, untamed or silly. Hence, subcultures are seldom taken seriously and deemed to disappear as the students mature. Subcultures, however, have ushered in generations of adolescents into adulthood, providing affirming spaces for students who might otherwise feel marginalized among their peers. Subcultures also foster non-normative values that they often take with them as they grow. Sometimes, teachers may just forget how brutal secondary school education can be on students who undergo identity crisis, struggle to learn the canonical science jargons, and does not fit in. The appreciation and understanding of subcultures in science classrooms, however, is poor and this could be in part, due to two reasons.

First, schools and classrooms are traditionally places where teachers command authority in deciding the rules, regulations and routines. Subcultures (e.g., punk and cosplay) are often stereotypically associated with deviant practices, behaviours and thinking. Subcultures can be misconceived as the opposing undercurrents that intentionally contest the norms for the sake of doing it. This view renders the understanding of subculture as unimportant or something to be eradicated rather than understood and used to inform curriculum decisions.

Second, the current science education literature is picking up on cultural studies, with the *Cultural Studies of Science Education* journal devoted to this genre of work. However, most of the studies discussed cultures as though they represent the mainstream cultures of the context. But what if the cultures are, in fact, subcultures, which emerge from mainstream cultures and interact with the latter? How would our interpretations of cultures? A more nuanced approach to doing cultural studies in science education is needed to push the frontiers of this important field of work. In our work, we take the position that rather to deny or

dismiss the existence of subcultures or contest them in power struggles with students, it is worthwhile for teachers to understand how it plays out in the science classroom to shape the outcomes of teaching and learning. Rather than causing problems, subcultures often provide solutions to children in the form of a meaningful community (Haenfler, 2014).

Due to the limited space available, a more elaborate discussion of subculture is provided in Appendix A. Below, we summarise a few key points about subculture:

1. Subcultures are dependent on a milieu of beliefs and practices.

2. There is variability in the culture of the group.

3. Subcultures are regarded as non-homogenous and non-static systems.

4. Subcultures not only focus on values, worldviews, themes or folk ideas as these do not exhaust cultural content.

5. The response of the community can play a role in creating subcultures by bringing similar groups into contact.

Similar to the term "culture" (Baldwin, Faulkner, Hecht, & Lindsley, 2006), "subculture" is a nebulous term. Hence, it would not be possible or justifiable to pin-point the subculture of a class simply because it can be defined in many ways. As such, we want to return to the opening excerpt which inspired this study and to frame the analysis of subculture within the common phenomenon of "owning". During the study, we learned from the students that this practice (if you will call it) is something that resonated with most (if not all) NA students.

STATEMENT OF PROBLEMS

One of the goals of this study was to develop explanations for some of the phenomena we have observed in the NA science classrooms during our two-year study in the NIE Project OER 51/12 TWT. Specifically, we noticed the ongoing contestations between the teachers and students in the four NA science classrooms in two schools. There were different degrees

of power struggles but generally, in all four classes, we saw the teachers trying very hard to deliver the lessons amidst the student resistance (Boren, 2001; Giroux, 1983; McFarland, 2001), both quiet and outward display, to learn.

Based on our microanalysis of sampled 24 classroom videos from four NA and four NT case study classrooms in the project OER 51/12 TWT, 18 per cent of the total curriculum time was spent on disciplining students. In addition to the qualitative data drawn from case study classrooms and schools, our quantitative study of 4,582 Secondary 1 and 2 NA and NT students from 39 mainstream and co-ed Singapore schools showed that the all four groups of students showed a decrease in science inference skills during the academic year 2014 (Teo, Goh, Khin, & Yeo, 2018). The results alluded to the lack of emphasis on developing science inference (process) skills in the science classrooms. Teachers could be struggling to keep up with classroom discipline and hence, devoted more time to content delivery than process skills. In sum, our hypothesis is that there are subcultures in the lower track science classrooms shaping the phenomena that we observed. In this study, we analyse subculture, and how it is interpreted and manifested in a lower track science classroom through the interactions of the students and teachers. The findings can offer science teachers insights that illuminate the complex and dynamic forces that interplay with their science teaching, so that they can understand and *work with*, rather than *against* student agency.

THEORETICAL FRAMEWORK

We apply the theoretical framework of symbolic interaction (Blumer, 1969) to generate explanations that provide substantive knowledge on how the lower progress students experience their science lessons. Due to the limited space available, a summary of symbolic interactionism is provided below. A more elaborate discussion is provided in Appendix B.

In this study, the NA students form the case subjects whom we aim to understand in-depth the existence of subcultures, how they create and live out the subcultures in the science classrooms. We centre our analysis on the meanings of these three aspects as the students

interact with other social agents or power brokers (peers and teachers) to construct, interpret, modify, and apply these meanings to their science learning experiences. These meanings are not intrinsic, objectively found, emanating from within, or merely an expression of psychological components such as emotions, feelings, memories, attitudes, or so on. Rather, these meanings are derived in the process of interaction between the students and others as they collectively act on each other to define and enact the science curriculum. In other words, meanings are social products generated through dialogues and interactive process of meaning creation. It is also on the basis of these meanings that the students and teachers carry out their actions. Hence, they are perceived as acting units who have agency in the creation and interpretation of meaning. Further, meanings are not simply applied as previously established when used, but subjected to an interpretive process. This interpretive process involves self-interactive formative process in which an individual communicates to oneself the thing towards which he or she is acting and had meaning, selecting, checking, suspending, regrouping, and transforming meanings depending on the situation and direction of actions. Hence, there is interactional order present between the social world and individual.

Symbolic interactionism is grounded in "root images" (Blumer, 1969, p. 6), which can be used as analytical "frames" to examine the nature of human groups or societies, social interaction, objects, human being as actor, human action, and interconnection of lines of action. The four main tenets of symbolic interactionism are: (1) people act on the basis of the meanings of objects that constitutes the world and not on the externally imposed meanings by others; (2) people meet in different situations and indicate lines of actions to others and interpret other's lines of action–the process of sustains, undermines, modifies, and transforms these lines–hence, social interaction is thus to be observed empirically and not fixed in advanced; (3) the social action should be observed in the position of the social actor who is an active organizer or acting unit of constructed action in an operating situation in which he handles and try to work out a line of action; (4) the society is a molar unit consisting of arrangements of people performing social actions at their respective positions in the larger

organization and their actions concatenate to form the larger organization of actions. Hence, joint actions and organizations are not automatically sustained but depend on the meanings people attached to the situations.

PURPOSE OF STUDY

The purpose of this study is to examine the subcultures of lower progress students with the aim to understand the sets of understandings, behaviours and artefacts used by these students, and which are diffused through interlocking group networks. Specifically, this study focused on Secondary 2 Normal Academic (NA) students for three reasons. First, we think that the NA students form the "sandwich class" of science learners who are most "disadvantaged" among the three (Express, Normal Academic, and Normal Technical) groups of learners. While the Express and Normal Technical track students take a four-year course, which culminates in one national examination, the NA students undergo a five-year course and sit for two national examinations. Second, while the NT science syllabus and curriculum are written in bite-sized manner so that it is more easily understood, the NA curriculum is similar to the Express curriculum and demands good English, writing, and analytical skills (OER51/12 TWT study, teacher interview, October 10, 2014). These skills are lacking in lower progress learners and are, in part, reasons why they are emplaced in the Normal tracks. Third, we studied a Secondary 2 and not Secondary 1 class because some form of subcultures would have been established by the second year of study.

The research questions addressed in this study are:

1. What is/are the subculture(s) of Singapore Normal Academic science classrooms?

2. How do(es) subculture(s) form in Singapore Normal Academic science classrooms?

3. How do(es) subcultures affect science teaching and learning in Singapore Normal Academic science classrooms?

PARTICIPANTS

The study was conducted in a Secondary 2 NA science classroom. The science lessons were taught by two science teachers who took turns to teach different topics. One teacher, Mr Lim, was a beginning teacher. The other science teacher, Mrs Tan, was an experienced teacher. We also interviewed the School Principal to find out about the school culture. Participation in this study was voluntary; consent and/or assent forms were obtained prior to the start of the data collection.

METHODOLOGY/DESIGN

Data Collection

Data collection included lesson videoing and interviews (refer to Appendix C for interview protocols) with the school principal, science teachers and students in one Secondary 2 NA class. A total of 12 lesson videos with evidence of "owning" were collected and each lesson duration was between 30-50 minutes. Each interview lasted between 30-60 minutes. The lesson videos and interviews were transcribed to address the respective research questions.

Data Analysis

In the data analysis, we focused on the construct of "owning" as a defining characteristic of subculture in the case study class. This phenomenon was evident through their vivid and elaborate descriptions of the practice of "owning" during the interviews and classroom interactions. As such, "owning" form the focus of our analysis of subculture. In analysing the interviews, we focused on the definitions of "owning", different forms of "owning", different terms related to "owning", and so on. This set of data was used to address Research Question 1.

In the analysis of the lesson videos, we adopted event-oriented inquiry (Tobin, 2014) in identifying significant episodes that illustrated "owning" at play during the lesson. These

lessons were transcribed and then analysed further for nature of the power relationships. In our analysis, we situated such significant episodes within the larger school culture of care and academic achievement (from the Principal interview) and hence, unpacked the power relationships as situated within these two elements of the school cultures to address Research Question 2.

To address Research Question 3, we viewed all the lesson videos and selected one episode to illustrate "owning" and how the teacher attended to it.

It should be noted that the purpose of this case study is not to generalise the findings. Hence, the data were selectively analysed to provide an in-depth analysis and illustration of the subculture in the class. To ensure that research validity is obtained, the researchers, one teacher (Mr Lim), and research consultant had discussed at length on the construct of "owning". The research consultant and researchers coded the interview data collectively. The coded data were then subsequently used to agree upon the selected episodes on "owning" and analysed further.

FINDINGS / RESULTS

Research Question 1: What is/are the subculture(s) of Singapore Normal Academic science classrooms?

In this section, we provide an elaborate discussion about "owning" found from the teacher and students interviews.

Terminologies and definitions

According to the teacher and students, words similar to *own* include "got", "burn", "roasting", "savage", "wrecked", "dissing" and "flaming". The words differ in terms of the intensity of the *owning*. For example, "got" is less hurtful than "wrecking" or "dissing". However, it is not clear that the students understood the nuances in the different words.

Owning has been defined in the following ways by the students. According to them, owning could be about:

1. Creating a situation which does not allow the person being owned to respond

2. Making fun of others

3. Humiliating or outsmarting others

4. Retaliating or taking revenge on another person

The first case of "owning" was commonly played out in the classroom. For example, a student said, "That means like the teacher talk back to you, then later you talk back in a way that the teacher cannot [or] don't know how to respond." This could happen as the teacher may not have expected a retort from the student and was focused on moving the lesson along. It was also common to see students making fun of some teachers. A student gave an example of this: "Look at that dude! He's like a coconut!" In this case, the student was referring to another person who could be a student or teacher. According to the Urban Dictionary, a "coconut" is used to refer to a person of colour who acts white. It could also refer to the physical appearance of a person such as someone with a coconut haircut (i.e., thick bangs to make the overall head look round).

In the third case, a student mentioned that "to burn" can be harsh because it is about outsmarting and humiliating a person at the same time. There is little regard for the feelings of the person being burned. For example, a student said,

> They…actually my humiliation part is actually kind of correct. Because "burn" is also, it's the same…like meaning for humiliation. "Burn", is either you "burn" like…you know like you…"burn" is more like you outsmart the person. Er, you know? It's kind of harsh…in a harsh way. You outsmart a person in a harsh way. In a more like harsher way. Like you don't care about the person. And you just outsmart him.

The last case could be more disrespectful. For example, a student said, "I don't know own lah [a slang], but I know burn like, it's like…talking against the teacher like dat [a slang]."

In the four definitions of "owning" provided by students above, there is a graduation in terms of simply talking back with no ill-intentions to imposing deliberate hurt.

As such, "owning" is understood and used differently by different students for various purposes. However, what is common is that "owning" involves interactive exchanges between two or more persons such that one side will eventually gain an upper hand over the other.

Sources

The students had identified different origins of "owning". One of them said, "Like from the internet, people talk about someone; a person cannot respond, so you say 'roasted' or 'burn'." Another possible source is the television shows. A student mentioned about a British stand-up comedy show called the "Jeff Ross Presents Roast Battle". Below is an excerpt taken from the official website of the show:

> Roast Battle pits two rising comics against each other in an all-out war before a panel of judges including Roastmaster General Jeff Ross. Childhood traumas may be dreged up, and painful divorces might be mocked, but these battles always end in a hug. (Comedy Central, 2019)

Students also learn about the word "own" from watching what happened in class and hearing how her classmates described the episode. One student described her class in the previous year to be similar to having a "riot", citing the larger class size of 40 students as the reason for this. She described what happened to her English Literature teacher and Science teacher:

> Every time when, people like talk or what right…Then he [a classmate] talk back. Like savage stuff lah [a slang]. Then they [her other classmates] will be like, "Oh…! He own teacherrrr!" Then after that that time, I think Mr Lim [science teacher] last year also kena [Malay word to mean being afflicted]. Always kena by, it's either Norman, Sayfudin, Samsam, or... ya [a slang], or Ahmad."

According to a student, she said that it was just a well-known "Trend right? Singapore language".

Based on the above-mentioned sources of the word "own", it seems that the word has been imported from a Western culture and assimilated into the classroom lives of students. Reinforced understandings of the word have been achieved through the frequent replay of the actions of "owning" and the verbalization of the word to describe what students were doing in class. The word gave meaning to the actions and behaviours of students participating in the "owning" process to forge a feeling of identity, recognition by their peers, or a sense of belonging to a group known to inflict some embarrassment, for instance, on their teachers. Because it can be so natural, common, and ingrained, one student regarded it is a "Singapore language".

Conditions for successful owning

There are many conditions for "owning" to be successful hence, not everyone or every attempt to "own" will come to fruition and will terminate prematurely. According to the students and teacher interviewed, the person who exert or initiate the act of "owning" must, for instance, be one who is good at making fun of others. The person(s) at the receiving end of "owning" should be someone who can quickly talk back, respond, or retort. According to students, this person should be "kind", "calm", "jokes", can be "outsmart easily by others", and/or "not witty". The exchange should be "rude but not rude", is "context-dependent", allows for "making mistakes" and evokes "retaliation". What this means is that the degree of "owning", and whether it would escalate to more aggravated forms, depends on the intent of the initiator who starts the process, the receptiveness of the receiver, the intent of the "owning", the place (space, timing, context), and position (relative to others and contexts) when "owning" happens.

Owning others and being owned

In this section, I describe examples of "owning others" and "being owned" that students have provided. The excerpts from students' interviews illuminate their understanding of "owning".

Excerpt 1: Like someone made this comment saying that—it was a girl—I don't remember who. Say she was colour-blind. And then Mrs Teo say, "Can't be colourblind, because the change of your…getting it is 1%. Because mostly only occurs in boys." So it's kind of like, you know, like a "burn", but I don't think that is how students say it. But in a way it is a "burn". But it is telling facts…and telling this person.

Excerpt 1 is an example of "owning" another person by playing with mixed reality through jokes. In this case, the student recounted an episode when the teacher (Mrs Teo) retorted a female classmate's comment that she was colour-blind in saying that such conditions happened mostly in boys. Hence, unless the student is a boy, she could not be blind. It also indirectly implied that the girl was lying about her condition. This student called it a "burn" rather than an "owning" incident, possibly because she felt that Mrs Teo was a bit curt in her response to the girl's comment.

Excerpt 2: It could be logical and non-logical. If non-logical it is just funny then, I think most of the class will get it? If it is logical probably the entire class only some people get it.

Excerpt 2 alludes to the complexity of "owning" and the need to juggle between being abstract or direct. Earlier, a student also mentioned about being "rude and not rude". For the game of "owning" to continue, there needs to be some space for ambiguity and space such that both sides would want to carry on. Both sides and the audience watching the two sides pit against each other, must find an element of fun and understand (to some extent) what is going on so that they can all participate. In other words, there must be connections among the players and audience so that everyone is connected in the game.

Excerpt 3: I have not really seen it ["owning"] in action in other teacher's class but I believe it is an ongoing process in every class just that every teacher and students have different forms of manifestation. Because, for example, when I teach 204 [Class] when I teach Sec[ondary] 4 and Sec[ondary] 3 classes when I have this word play, power play, it may be a different form. For example, when I teach my colourful Sec[ondary] 4 class they will be more playful and more explicit in their words. Then I will have to make a judgement whether I should carry on to have wordplay with them or stop it with them because there is an added dimension there because Sec[ondary] 4, they are more willing to experiment ah [slang]. So luckily for me, they are not being malicious. They are only trying to like, how should I put in English…like trying to fake a sense of that they know a lot of things, like a sense of superiority so they will try to

say something then if the teacher give a positive reaction, they will give a plus one to their reputation. Using their teacher to affirm their credibility.

Excerpt 3 is taken from the teacher interview. According to him, "owning" was played out differently in each classroom. What he had experienced with the Secondary 3 and 4 (Grade 9-10, aged 15-16) students was in the form of a word play and he saw it as a power play as well. He described his Secondary 4 students as "colourful" because the students were of diverse characters; they openly engage in the word play with him. He saw the need in making a judgement as to carry on or to stop, possibly because the Secondary 4 students had to focus on their national examinations and hence, curriculum time had to be spent more prudently. He interpreted the goal of these students as using "owning" to raise their status among their peers and in front of the teacher by showing off their knowledge. "Owning" was not something the students did to hurt him.

Qualities of owning

The qualities of owning can differ a lot. For example, it can be playful or friendly. A student called it "lame". It could be something that everyone can relate to and not personal. An example given by a student was, "Like someone say, 'I'm waiting for my friend'. Can just say, 'You got friend meh [slang]?" On the other hand, "owning" can be serious, harmful or painful because the "own" is personal, direct or intentionally done to hurt. For example, a student described an incident where a classmate said that he had missed the passing grade by one mark, "Zeena say she missed one mark. And then Miss Lee was like, 'I not miss one mark. You are the one that missed one mark. Then later, Zeena got "burned" by Miss Lee." The tone and context is important for evaluating the intent and whether everyone is "in on" the joke.

"Owning" typically takes place with at least two parties (comprising individuals or groups of individuals) and an audience. During "owning" the audience and parties participate in evaluating the "own" that was meted out. The evaluation could take the form of responses

such as laughter, "Oh!!!!!", acknowledgements, or even silence that rebuke an "own" to show support for the person who is being "owned" and to penalize the person who did the "owning".

How to win the "own"?

The students and teachers offered insights on how one can win the game of "owning". The player should be fast, is able to make a quick and good comeback, quick-witted, outgoing, bold and bubbly. To win the "own", what is said or expressed must be understood by most if not all people involved. The person must outsmart others. In not responding, flustering, or denying the "own", one loses.

Value of "owning"

"Owning" is a not child's play. Rather it is a purposeful practice in the subculture of the lower track science classroom. Not only students, but also teachers, participate in "owning" for various reasons. Students engage in "owning" because they wanted to have fun and through having fun, they build rapport with their peers and teachers. At times, "owning" becomes a tool for them to express their dissatisfaction or anger hence, they inflict hurt on others by making fun of others or even fight. When driven to boredom in the science lessons, where instructions can be didactic for most of the time, they use "owning" to break the monotony of the lessons. They may resort to "owning" as the means to discredit someone whom they did not like or show disrespect for teachers whom they were against due to various reasons. Like what the teacher had mentioned earlier, "owning" can be a way of establishing individual authority and anti-establishment identity through challenging the rules and norms. For example, they may not wear their school attire properly or refuse to stand and greet a teacher as a display of disobedience. In other cases, they use "owning" as the means to legitimize their own existence and increase their visibility in the classroom when the teachers engaging in the "owning" process with them hence, affirming their self-credibility. Another

student had also mentioned that sometimes, "owning" was just a random act with no intentions or purpose.

Teachers, on the other hand, may be inadvertently drawn into the game due to a slip of the tongue. Teck Yong, in the opening excerpt of this chapter, gave an example of this when a teacher mispronounced a word or used a word in class that incite students to start the wordplay. Teck Yong's teacher may respond to this by throwing a fit, shutting up students and telling them to stop. In such a case, the teacher could be seen as exercising his classroom management strategy to gain back control of the class. In reality, the students have earned the upper hand and succeeded in manipulating the teachers' emotions that will affect the rest of the lesson. In another words, it was a play of the wits with the teacher trying to assert authority and the students trying to outwit the teacher. Suppose that the teacher respond to the students with a joke and everyone laugh it off, the result could be rapport building. The teacher could laugh at himself/herself to demonstrate solidarity with students as learners who could make mistakes and re-learn. Ultimately, the goal is to get "buy in" from students so that they "stay with him" throughout the lesson.

Where are the limits?

There are limits to how far one should take a game. Unlike the context of the stand-up comedy "Jeff Ross Presents Roast Battle" where there is a host and live recording, the situation can get out of hand in the classroom if teachers and/or students take it too far and cross the line. The threshold would be much lower in a classroom context because it has traditionally been shaped by the dominant cultures of schooling that positions teachers as the authoritative figure and there are school rules to follow and social expectation to adhere to. However, this norm also means that it could be easy for teachers to cross the line and become too sarcastic, unintentionally. Students do address power issues by pushing back on the boundaries. For example, they would gave names to teachers and their peers. A student talked about her peers giving a girl a nickname "Angry Bird" because she was always angry.

When taken a bit further, "owning" become "burning". An example of this is an ethnic burn which a student had recounted,

> My form teacher, everything. He like to give nasty comments one. Like you know that time huh, we learn Geography, then like, about the world, country, all. Then after that got this one name... something Babas ah. Then after that he say, Ahmad Ter Babas. He make fun of Ahmad's name. With the country name. Then like Mdm Neela, cause I think that is like one part of India, the country. Then after that right, Mdm Neela is like, "You don't anyhow say people la." Because she feel hurt also ah, because she also like half Indian. Something like that. So like you know, Syfuddin also is like half Indian, then he anyhow say got [inaudible].

The student gave an example of a teacher who played with the name of a student when he was teaching the topic on the Peranakans, or Straits-born Chinese. Peranakans are the descendants of the Chinese immigrants who came to the Malay archipelago during the 15th and 17th centuries. The men are called Babas and the women are called Nonyas. In this case, the teacher had played with the name of a student. Another teacher, Mdm Neela, however, put a stop to the practice of making fun of students' names. In cases when the person receiving the "burn" is unable to make a comeback, this "burn" can be perceived as a form of bullying.

To summarise, "owning" happens when the person who receives the "own" takes and gives back. In the process, everyone has a good laugh. It fails when the receiver makes no comeback, for example, when there is silence or no response. Sometimes there is a response, but it is lame or "cold". It can also fail when the receiver feels hurt and when taken the extreme, words can be a form of symbolic violence (Bourdieu, 1979).

Research Question 2: How do(es) subculture(s) form in Singapore Normal Academic science classrooms?

The subculture of owning illuminates the power play between the teachers and students during the science lessons. To understand how subcultures form, it would make sense to unpack the three forms of power relationships – teacher-dominance, students-dominance, and balanced relationship – that play out during the lesson. As mentioned earlier,

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we do not see the subculture as independent of the more dominant and larger school culture of care and academic achievement as described by the School Principal. As such, we present selected data below to illustrate how subculture is formed through power play (refer to accepted book chapter in Appendix D for more detailed writeup). To give an example, Excerpt 4 shows an episode where a student was trying to "own" Mr Lim during the lesson.

> ***Excerpt 4:* Student-dominance to teacher-dominance**
> Mr Lim: [Trying to press projector button, tiptoes, uses pen to help reach]
> Uma: Hahaha, short. [Laughs, then covers mouth]
> Julia: Cher, WhatsApp group you never reply.
> Sair: Cher, cher, cher, Uma say you short.
> Uma: I didn't.
> Raafe: I say you tall.
> Mr Lim: It's ok, you guys can become taller.
> Julia: When you reach puberty.
> Mr Lim: Ok, right now, who knows, what are the homework? [Raises hand]

In the above episode, Sair attempted to "own" the teacher by borrowing Uma's laughter to poke fun at Mr Lim's difficulty in pulling down the projector screen. The joke was non-malicious as Mr Lim was rather tall (about 1.8 metres) and hence, saying that Mr Lim was short would not really hurt. Mr Lim was able to terminate the "owning" by highlighting the fact that the students can become taller (meaning that they are not tall) and directing their attention to their homework—a hard reality that the students had to confront. This turn of event had switched the power relationship from student dominance to teacher-dominance. This episode illuminates how the subculture of "owning" was enacted through the control of power and also the recognition that academic achievements take priority in the classroom discourse.

> ***Excerpt 5:***
> [During spelling test, teacher is reading the word to be spelt by the class]
> Mr Lim: Number 13. Emulsification.
> Li Wei: [With funny pronunciation] E*mul*sification!
> Amira: E*mul*sification!
> Mr Lim: Ok, e*mul*sification.
> Sair: E*mul*sification!

Earlier, we pointed out how students would own teachers by making fun of their pronunciation. Several episodes of this could be found from the lesson videos. Excerpt 5

shows an example of how a student initiated an attempt to "own" the teacher by making fun of how he pronounced a word and another student (Amira) joined in to reinforce the "owning". With Amira's participation, Li Wei had garnered support and attention of his peer who would join in the "owning' process. Even with Mr Lim's interception in trying to correct his own pronunciation, Sair's outburst suggested that the "owning" was not over. Once again, we saw how the students would leverage on some "tools" (in this case, a wrongly pronounced word" to kick start an owning process. This process involved the teacher and students taking turns to come into control and several students working together to perpetuate the "owning" process.

Research Question 3: How do(es) subcultures affect science teaching and learning in Singapore Normal Academic science classrooms?

The subculture of "owning" had effect on how science teaching and learning took place in the classroom. Multiple episodes of "owning" using wordplay was played out during the teacher's attempt for students to pick up the scientific terms. For illustration purpose, one episode is shown below:

> ***Excerpt 6***
> Mr Lim: Ya, the air that exhale contain more carbon dioxide. So this more carbon dioxide will do what? It will react with your limewater to form a white precipitate
>
> Mr Lim: What do I mean by white precipitate? It's something like this. Take a look at this
> Student: Cher the water foggy
> Mr Lim: No I don't want to see the words 'foggy' 'milky' 'chalky' don't want. I want to see the word white precipitate
> Student: [inaudible]
> Student: Milky
>
> Mr Lim: so if you all see, some of you who are very observant
> Student: Woah
> Mr Lim: you can see that it is changing already
> Student: Wow it's turning to milk
> Student: Cher
>
> Mr Lim: So I already said I don't want to see the word milky, chalky or whatever
> Student: Chalky

Mr Lim: This is white precipitate
Student: Cher
Student: [inaudible]
Student: Why is the [inaudible] so [inaudible]

In this episode, the teacher (Mr Lim) had reiterated many times to students that they should use the term "precipitate" and not "chalky", "foggy", and "milky" to describe the cloudiness of the limewater when carbon dioxide was bubbled into it. However, there were students who contested this by shouting out "chalky" and "milky" probably to frustrate Mr Lim intentionally and also to show their resistance towards accepting the formal nomenclature of science. Again, this brings back the point about subcultures as something emergent from within the subculture group in resistance to the norms and conventions. After all, precipitate is a big word to describe what was formed while and the terms "chalky", "foggy" and "milky" more accurately describe their observations, which was what the students were asked to do. The way Mr Lim dealt with the "owning" was by enforcing his authority as a teacher in saying "I don't want to see the word…" rather than providing good reasoning to help students understand why "white precipitate" was a more acceptable term in science. Following this episode, students were asking for the definition of "precipitate". Below is the excerpt:

Excerpt 7
Student: Cher cher, precipitate means the
Mr Lim: Precipitate. What does precipitate mean?
Student: Stuff that doesn't
Mr Lim: Solid that
Student: solid that cannot dissolve
Mr Lim: do not dissolve. Can?
Student: Yes

The student had accepted the use of the term but wanted to know what it means. Hence, this episode suggests that a teacher can be successful in winning the bid to "own" students by helping them to understand why certain canonical terms in science are more acceptable than others rather than dismissing the use of less acceptable terms.

CONTRIBUTIONS OF THE STUDY

The existing literature focusing on lower progress learners in Singapore mostly adopt post-positivist (see e.g., Ang, Neubronner, Oh, & Leong, 2006; Ee, Wang, Koh, Tan, & Liu, 2009; Koh, Tan, Wang, Ee, & Liu, 2007; Koh, Wang, Tan, Liu, & Ee, 2009; Low, King, & Caleon, 2016) and constructivist (see e.g., Ho, 2012; Kang, 2005) approaches to studying lower progress learners. This study adopts the transformative approach and can potentially yield alternative and critical insights not offered by previous studies. To our knowledge, the current cultural science education research studies have not (or seldom make explicit) differentiated between dominant cultures or subcultures. As such, cultures are often referred to or assumed to make up the dominant forces in any context. The literature ignores the possibility that other non-dominant or non-mainstream cultures could be present to counteract or reinforce the dominant and mainstream cultures. This study brings the attention of science researchers doing cultural studies to the nuances of culture and subcultures in interpreting data and hopefully, push frontiers in this area of study.

Contributions to Theory

Current studies of subcultures are situated within societies. This study has contributed to a better understanding of subcultures within education context. The in-depth analysis of the subculture of "owning" also helps to underscore the richness of cultures within subcultures and illuminate the difficulty in trying to define what culture and subculture are. Here, we attempt to address this challenge by identifying the practice of "owning" which was emergent and resonated with all the research participants and (according to them) their peers. Below are a two points about subcultures that we have gleaned from the study. A more elaborate discussion can be found in Appendix D.

1. ***Subcultures is shaped by power play of social agents:*** Subculture of this lower track science classroom is shaped by the exercise of control by the teacher and

students, depending on when they chose to advance or retract in the next course of actions. Such decisions will determine how the science lesson will progress thereafter. For example, the students may get too carried away if the teacher had continued to engage in the non-science discourse. If the teacher started scolding the students, he may lose the rapport with them and science learning would not progress either

2. ***Subculture is aggregative and not individualistic:*** Subculture of this class was formed by an aggregation of practices, situations, stories, experiences, and beliefs of two or more individuals in order to gain prominence in the classroom. When several students combined their efforts and became successful in detracting the science classroom conversations, they made the second attempt in the bid to "own" the teacher. That is also how the subculture of "owning" (Teo, 2018) become a common practice in the lower track classrooms, and in this science classroom.

Contributions to Practice

An important implication of this study is that pedagogical considerations of science teaching should be embedded within subcultures of a classroom. Earlier, we argued that science teachers should *work with* rather than *work against* the students when teaching science lessons as "owning" can be a resource for relationship building. The findings have implications on science teaching as teachers learn how they should manage "owning", a frequent practice in the subculture of such classrooms.

First, students said that they viewed teachers who can engage in the game of "owning", which I will now see as "controlled burn", were cool, playful, fun, caring and kind. Teachers who are slow-witted, does not speak properly, and do not know how to "own" students are likely to out of the game. Students who are successful in "owning" can benefit from the game in raising their social status among their peers, be regarded as funny and witty, or seen as

having some degree of authority. In sum, students who could participate casually with enjoyment would most likely find the classroom conducive for learning.

Second, teachers who cannot "own" students may be perceived as too lenient and wasting instructional time. For example, a teacher commented on how she thought that a colleague has often allowed students to "own" him and hence, resulted in frequent loss of curriculum time. She said, "They [the students] will like say something, then he will react. Then he will say again, then they will react, then he wins. Sometimes the student wins. It's just entertainment but this entertainment is also cost time wasted." In such cases, students may "own" teachers to show disrespect and frustration for the lack of teacher authority. This can, in turn, distract the teacher and disturb the lessons. Elsewhere, I have written about such a case (Teo, 2018b) where the teacher failed to "own" the students. Instead of participating in the "owning" process, he chose to detract from the issue at hand and retreated to his defensive mode. In their resistance, the students resorted to disturb every lesson taught by this teacher.

Third, a teacher who "own" students with the intent to exercise full control over them will most likely fail badly in "owning". Students may resist authority by overtly challenging the teacher hence, inviting punishment. Alternatively, students may resist covertly by exhibiting hostility, passiveness, and not preparing for lessons. Bowles and Gintis (1976), Apple (1979), Giroux (1983), Willis (1977) and McFarland (2001) are examples of scholars who have discussed this topic in-depth. To provide a case example, Willis' study of working class boys (or "lads") in England showed how this group of students have actively worked against the social reproduction of their class positions. In the same way, the students in the lower track classrooms may be retaliating against the reproduction of the cultural norm demanding that they listen, sit, not question, and follow as instructed.

Ultimately, this subculture of "owning" is a game that the students play with the motive to make the science lessons different from what it is usually like—teacher-centred and monotonous. Several implications for science teachers can be drawn here.

First and foremost, science teachers should be aware of the games that students play and understand them. In this case, it is the game of "owning". To engage in the game with students should not be perceived as lowering oneself to their level and participating in something easily brushed aside as "child's play". Instead, it is about learning what is going on with the students and self so that teachers can ameliorate rather than exacerbate a simple situation that could be blown out of proportions and disrupt teaching and learning in the classrooms. This has deep implications for science teachers as they look to create affordances that support students' abstract science learning in various formal (classroom and science laboratories) and informal contexts.

As Foster (1990) has encouraged, teachers should try to develop a teaching style reflective of their personality. If they can play the game of "owning" while maintaining order and teach, they should do so. In this paper, I did not report on what happened in class during the science lesson observations but I have observed teachers who could "own" the students, get "owned" by them, or not even realize that "owning" was taking place. As a student has compared, the teacher whom they "owned" frequently had better rapport with them then another teacher who quickly cut them off with sarcasm. This has wide implications for science teachers who often find themselves in situations where students can easily leverage to "own" them.

Efforts to manage "owning" should be handled prudently. This is by no means an easy feat. As Mrs Tan had described her approach differed from Mr Lim's:

> Because he [Mr Lim] is… more, he is erm, he is [laughs] I don't know what to say. Erm, he cares about the student's feelings and he doesn't want to hurt their feelings. So sometimes he may entertain them. He is more into pastoral care, when they are tired they will just, okay come! Just endure for another five min[utes] and after four min[utes] I will tell you a lame joke. Then I was like… okay… So he will try his way to encourage and inspire them and not try to hurt them whereas I am the more direct them. Meaning, when I mean business, I mean business.

While teachers may want to participate in the game of "owning" to connect with students, Foster (1990) has aptly cautioned teachers to not try to be "one of the kids". For example,

science teachers may be attuned to the students' "owning", recognizing one when it happens, and taking pre-emptive steps to ensure that they are not caught in embarrassing situations when teaching certain topics. However, they should not be the ones to create such situations as this may invoke disgust and feelings of unnaturalness.

CONCLUSIONS

We have provided an in-depth discussion of the subculture of "owning" in a Singapore Normal Academic classroom. Specifically, we have identified the different terminologies and definitions of "owning", sources of "owning", conditions for successful "owning", qualities of "owning", ways to win the "own", the value of "owning", and the limits to "owning". Subcultures form through the interplay of power relationships in the classroom. The power relationships may be teacher-dominated, student-dominated, or balanced. Here, we have analysed how power relationships work in the context of the dominant school culture of care and academic achievement espoused by the School Principal. Further discussions of how the subculture of "owning" impact science teaching and learning were offered. Implications for theory building of subculture and practice were provided.

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APPENDICES

Appendix A: Subculture

A literature search on "subcultures" the top four science education research journals and the *Cultural Studies of Science Education* did not yield many papers that discussed about the subcultures of lower track classrooms. Subculture studies in science education have discussed about helping students border cross between their own local subcultures (e.g., home cultures) and the subcultures of western science (Aikenhead, 1996, 1998; Baimba, Katterns, Kirkwood, 1993; Baker & Taylor, 1995; Brand & Glasson, 2004; Cobern, 1991; George, 1995; Hewson, 1988; Jegede, 1995; Jegede & Aikenhead, 1999; Krogh & Thomson, 2005; Lave & Wenger, 1991; Lyons, 2006; Pickering, 1992; Sadler & Zeidler, 2009; Wenger, 1999). As such, science students must deal with and participate in several different subcultures (Costa, 1995). Due to the scarcity of subculture research in science education, in this section, we will elaborate on what constitutes subcultures (Fine & Kleinman, 1979; Haenfler, 2014) drawn from the literature outside of science education research and then cite a few related studies from science education that discussed or mentioned about subcultures.

First, subcultures are dependent on a milieu of beliefs and practices. They are not comprised of an aggregate of persons. As such, in examining the subcultures of the NA classroom, we are not focusing on the structural membership of the students (e.g., the class they are put into) but regard them as a group of people who adopt shared values and behaviours (Yerrick, 1999). Subcultures create their own explanations through their shared experiences, values and beliefs (Aikenhead, 2000).

Second, there is variability in the culture of the group. Subcultures co-exist within a culture such as rural and urban communities (Dhindsa, 2005), and tribal, traditional religious, and secular subcultures (Haidar, 1997). For this reason, it is not good enough to adopt only case study or survey methodologies when studying subcultures. Neither of these approaches can provide valid indicators of the vitality of subcultures. The research methodology (discussed later) should show communication within the student group of interest, and that the members of different student population segments share a common identification. As such,

the case study findings may not be representative of the group. Surveys are not able to capture the customs, behaviours, shared understandings, and artefacts.

Third, subcultures are regarded as non-homogenous and non-static systems. As such, cultures can change over time and this could be due to the negotiations of meaning even in homogenous systems, resulting in the continual production of socially constructed realities (Berger & Luckmann, 1967). Change is endemic to culture and arises because those who share the subculture traditions interact to varying degrees with others in the society who do not. Some subcultures will be transformed through the incorporation of these into the subculture system. The implication of this is that the research design is that it will not suffice to compare the elements of a subculture at the end of the predetermined time interval as it would omit the account of processes by which the cultural content is created, modified and diffused. This means that the fluidity of information transfer must be considered in the analysis.

Fourth, subcultures not only focus on values, worldviews, themes or folk ideas as these do not exhaust cultural content. According to Brickhouse, Lowery and Schultz (2000) and Tan and Calabrese Barton (2007), educating students for scientific literacy is not a straightforward process. The elements to consider include the visible (e.g., behaviours that shape the dynamics of an ongoing cultural system), physical (e.g., material elements, artefacts such as clothing, hairstyle, ritual objects, food, tools, play objects) and ideational (e.g., values, and norms).

Fifth, the response of the community can play a role in creating subcultures by bringing similar groups into contact. When there are encounters with agents of social control, identification with a larger population segment may be reinforced as opposed to having factional groups that might otherwise militate against it. Even when subcultural identification exists, the reactions of outsiders may affect its centrality. Outsiders may give undue attention to individuals' participation in activities with members of particular groups, causing the identification to become an issue for the individual. When the community ignores the sub

society, the members may lose interest in the group or no longer feel ashamed to reveal their

membership.

Appendix B: Symbolic Interactionism (Theoretical Framework)

Symbolic interactionism is grounded in "root images" (Blumer, 1969, p. 6), which can be used as analytical "frames" to examine the nature of human groups or societies, social interaction, objects, human being as actor, human action, and interconnection of lines of action. Below, we elaborate on social interactions as perceived from the symbolic interactionist lens.

First, human society or group life is perceived as consisting of human beings engaging in action in multitudinous activities. Whether in examining culture or social structure, human society is regarded as existing in social actions in which activities belong to acting individuals even as they act collectively or for others. In the classroom, a representative of a micro social world, is also where teachers and students engage in social actions of meaning (re)creation through a wide genre of complex activities for the purpose of knowledge attainment, cognitive development, moral and value reinforcements.

Second, social interaction is not a forum, means, medium, or setting for expression of pre-existing factors or release of human conduct or behaviour, but a process that forms human conduct or behaviour. This idea is used by Erving Goffman (1959, 1975) to explain how people interpret others and the situation to act out a "line" in intentional and unintentional ways in order to be in, have, or maintain "face". Blumer (1969) explained this as the symbolic interactive interpretation process in which individuals take into account what each other is doing or is about to do, conduct, and manage situations. Therefore, one's line of activity is fitted in some ways to the actions of others and not merely an expression of what one is disposed to do. According to Mead (1934), in order for effective communication and hence interaction and joint action to occur, the act performed by the individual who plans an action, and the act that is signified to the other individual to whom it is directed must be understood in articulation by taking each other's standpoint. When teachers make a point in class or gesture, they interpreted the necessity, importance, or value in saying or doing it and anticipate possible responses from students. The students respond to the "line" and pattern of action is

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constructed through this joint act. This is also how analysis in discourse takes place in assuming patterned acts.

Third, objects or products of symbolic interactionism are anything that can be indicated, pointed to, or referred to. Common objects emerge from the process of mutual indication and carry the same meaning when understood and perceived in the same way by the group of individuals. This is achieved by identifying the individual's world of objects before developing actions to manage these objects which are social constructs carrying no fixed meanings or status as they are continually formed, sustained, transformed, or discarded. Hence, the line of action changes through this evolving process of defining the world of objects. In talking about subcultures in the science classroom, two "objects" subjected to scrutiny are subcultures and science – how does the science curriculum look like and what changes are expected in reform. In the symbolic interaction process, inquiry and reform are contextually defined as they embody circumscribed meanings constructed, defined, argued, described, negotiated, and moderated by different power brokers engaged in this joint social process. This brings me to the fourth point in symbolic interactionist view of human beings as acting organisms.

Contrary to the view of individuals acting and being acted upon by different factors, the symbolic interactionist view human beings as possessing a "self" (Mead, 1934) such that they become an object of their own actions when they take an external position looking inward to examine their roles as discrete individuals, team players, or some general "other". Blumer (1969) described this "self" as a "social self" in which an individual makes indications to oneself about an object and gives meaning to it when consciously thinking and performing an act. This self-indication leads to further interpretations and direct actions. In this view, an individual is not simply regarded as merely responding or reacting to cognitive and psychological factors such as motivation, attitudes, need-dispositions, stimuli, role responsibilities, and status that play out on them, but rather creates the view of human beings as acting and social agents acting out. The issue with looking at the individual as responding to factors is that it does not explain or embrace how these factors are considered in actions. Blumer argued that one has

to get into the defining process of self-indication of meaning, interpretation, and taking note of one's goals, purposes, objectives, available means, image of self, anticipated actions of others and so on, in order to direct a projected line of action. Teachers and students, when positioned as social agents become empowered agents of change and professionals who can make adaptive curricular decisions in this defining process.

Lastly, the symbolic interactionist view of action is that it is interlinked. In social action, human beings would fit their lines of action to each other in order to be "in line", that is mutually understood. This horizontal linkage is the basis of the joint action in the social organization of conduct of diverse individuals. Each discrete individual in the larger organization engages in the localized process of self-indication and interpretation as they define their situations to create, form, use, or change meanings, but their separate acts are interlinked to form an aggregated joint action which in turn are extensions of the individual actions. Teachers, students, and other stakeholders form discrete entities of the larger academic institution of teaching and learning individually constructing their own meaning of teaching, learning, educating, and educated. But their actions are never independent of others' as educational process is social process and necessarily entails collaborative efforts in different areas. People also bring in worlds of objects, sets of meanings, and schemes of interpretations from previous actions of participation to create this joint action forming vertical linkages of actions. Teachers bring their prior teaching experiences, constructed understanding of others' expectations, and learning experiences as students and preservice teachers. Students bring in family values and teachings from home and previous schools. School administrators bring in their experiences in managing school districts, previous school, or knowledge of broader educational goals. Such horizontal and vertical linkages constituted the interconnectedness of joint action in symbolic interactionism.

Appendix C: Interview Protocols

<u>Student Interview (Start of the Year)</u>

1. What is your name?
2. Can you tell me something about your class/classmates?
3. What is your understanding of the word 'culture'?
4. What is the school culture?
    a. What makes up the school culture?
    b. Who decides the school culture?
5. Is there a classroom culture?
    a. What makes up your classroom culture?
    b. Who decides the classroom culture?
6. I notice that teenagers use a different lingo these days. Are there slangs (words/ phrases) that your friends will understand, but your teachers/ parents won't?
    a. What are some of them?
    b. Who came up with the word?
7. How would you describe your science lessons?
    a. Is the class the same or different with other teachers?
    b. Is there any difference with Mr Lim or Mrs Tan?
8. Which classmate do you feel is the leader during science lessons? Are they always like that in all lessons? Why do you see him/her as a leader?
    a. Do you consider yourself to be a leader or a follower?
    b. Do you see yourself belonging to any group in the science class?
        i. <u>If yes,</u>
            1. What are the things you do together?
            2. What are some things that are popular with you and your friends?
            3. What do you and them think about your science class?
        ii. <u>If no,</u>
            1. Who do you usually hang out with? What do you do together?
9. What sort of role do you play in the science class?
    a. How do you think your classmates will describe you?
10. Can you think of some things that students do, although they are not supposed to?
    a. What are they?
    b. Why do you think students do that?
11. I noticed some things that students do during the science class. I'll read them out, tell me when you think it happens, and <u>why do you think students do that</u>.
    a. Sleeping
    b. Making funny comments
    c. Bending chairs
    d. Walking around during lessons

Student Interview (Year-End)

1. Describing relationships with current teachers
2. What you think about each teacher?
3. "What type of interaction (jokes, advise, fierce, approachable, formal, informal)"
4. Do you think the class reacts differently to each teacher? How? Why?
5. How is Mr Lim as a form teacher? What is his role as a form teacher?
6. Do you think his relationship with the class is closer because he is your form teacher?
7. Have you heard of the term 'own the teacher' or 'burn the teacher'?
8. Where did you know this term from?
9. Where do you think this term comes from?
10. Do you think the teachers 'own' the class? Or the class 'own' the teacher?
11. How often? Examples?
12. Who gets 'owned' more?
13. Why do you think some teachers get 'owned' more?
14. Did you ever try to 'own' or 'burn' a teacher? Describe what happened. Why did you do it? What's your goal?

Teacher Interview (Start of the Year)
1. Please tell me something about yourself
    a. How many years have you taught in the school?
    b. Did you teach at other schools before this?
    c. How's your teaching experience thus far?
2. How would you describe your teaching experience in Class XXX thus far?
3. What is your understanding of the word 'culture'?
4. What is your understanding of the school culture—what school culture does Ms Lau aim to establish? What is your role in this?
5. Do you think Class XXX has a class culture? How would you describe it? Are you part of it? Do you think it aligns with the school's culture? How so?
6. Are there differences in the classroom culture of different classes—Express, NA and NT? What do you think about it?
7. How would you describe your relationship with the students in Class XXX?
8. Are there times of tensions between you and the students in Class XXX? Please elaborate on it. How did you manage it?

Teacher Interview (Year-End)

1. What kind of teacher-student relationship do you aim to have with your students?
2. Has this changed since you started teaching?
3. Is it different for different classes?
    i. What does it depend on?
    ii. Difference between form / non-form classes?
    iii. Difference between streams?
4. Is your relationship with 204 typical to your relationship with students in general?
5. Are there times of tensions between you and the students in 204?
6. How did you manage?

7. How familiar are you with the youth slang?
    - i.   *Burn, own, savage, diss*
    - ii. How did you get to know these terms?
        1. Origins?
        2. How frequent do you hear these in class?
    - iii. Is this language more prominent in certain classes?
        1. Which students?
        2. Which classes?
        3. Stream?
    - iv. Did they used to exist in your time/ when you started teaching?
    - v.   Why do they exist? (Do they serve a purpose to your students?)

Principal Interview

1. What is the school culture that you try to establish?
2. How do you go about doing it?
3. Do you think that all your teachers buy in to your idea and what is their role in it?
4. How about the students?
5. Do you think that the classroom culture is different? How so?
6. Are there differences in the classroom culture of different classes—Express, NA and NT? What do you think about it?
7. Do you think the teachers understand the classroom culture?
8. How do teachers resonate with the 2 types of culture?