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AUTHOR McGinnis, J. Randy

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ABSTRACT

This study qualitatively investigates the taboo and "noa" topics of Science-Technology-Society (STS) taught in two local cultures. Taboos are beliefs that constrain behavior by making those behaviors perceived as threatening by the members of the social group forbidden and improper for discussion. "Noa" is the Polynesian word that means the opposite of taboo. Topics considered "noa" are those topics considered ordinary and generally acceptable. The "noa" in STS instruction are those instructional topics that are generally perceived as appropriate for instruction in local cultures. These topics do not threaten the belief systems constructed in local cultures. Two participants in a voluntary 3-week summer STS inservice workshop responded to questionnaire and interview questions in order to construct viable models of the taboos and "noas" of STS topics taught in two local cultures. Both teachers were outsiders to the local culture in which they taught. Data analysis indicated reported differences in the local cultures' taboos and "noas." The first teacher reported taboos that included AIDS, evolution, sex education, extensive investigation of the local water supply, and tree cutting by the county; and "noas" that included the studying of whales and dolphins. The second teacher reported taboos that included abortion, nuclear war, and investigating the local culture's resources such as water and farmland; and "noas" that included creating imaginary animals, and playing with earthworms. This study concludes that some topics are considered taboo by the local culture and therefore are not taught by the teacher. (Contains 17 references.) (MDH)

The Taboo And Noa Of Teaching Science-Technology-Society (STS): A Constructivist Approach To Understanding The Rules Of Conduct Teachers Live By

J. Randy McGinnis
The University of Georgia

Paper presented at the annual meeting of the Southeastern Association for the Education of Teachers of Science, Wakulla Springs, Florida, February 14-15, 1992.

Abstract

This study in progress qualitatively investigates the taboo and noa topics of Science-Technology-Society taught in two local cultures. Taboos are beliefs that constrain behavior by making those behaviors perceived as threatening by the members of the social group forbidden and improper for discussion. Taboos are constructed by the social group to control behavior that threaten the culture's belief structure. Those STS topics that two science teachers avoided teaching in two different local cultures have been labelled taboo in this study. Noa is the opposite of taboo. Topics considered noa are those topics considered ordinary and generally accessible. The noa in STS instruction are those instructional topics that are generally perceived as appropriate for instruction in local cultures. These topics do not threaten the belief systems constructed in local cultures. Local cultures is an anthropological construct that reflects shared "local-universal understandings" among individuals of a community (Charron, 1991).

A constructivist theoretical perspective is used in this study. As a result, extensive use of raw data from the participants' perspectives is used to illustrate that the researcher's interpretation is a construction and not a discovered objective truth.

> Because of the difficulty of changing practices to conform with a given referent, it is not surprising that change takes so much time. Actions do not take place in isolation from a culture, and as a consequence, changes of an individual might not be met with the approval of other participants in a culture. Indeed, some changes that are contemplated might be taboo in this culture.
>
> Kenneth Tobin (1991,p.2)

Introduction

The teaching of Science, Technology, and Society (STS) topics to school age children is increasingly being advocated by the science education community as a critically needed infusion throughout the K-12 science education curriculum. Proponents believe that the study of socially relevant topics, such as nuclear energy, population growth, and environmental stresses, is thought to encourage interest, critical and high-level thinking, as well as problem-solving and decision-making capacity for a democratic system, in students (Zoller, Donn, Wild, and Beckett, 1991). Proponents of the STS movement argue that the change in the science curriculum is necessary for the future health of society and the environment (NSTA, 1982.)

Many of the topics inherent in STS education are controversial to the community-at-large and pose special problems for science teachers to teach in their local school districts. Ironically, the most relevant topics to students in a particular school are oftentimes perceived by science teachers in those schools to be too controversial to teach in the local culture. Research in determining which topics science teachers perceive to be forbidden or frowned upon to teach in their teaching context--their taboo topics--and how teachers then act on their beliefs has been traditionally neglected in science education.

Typically, those topics which have been accepted by local cultures as appropriate for STS instruction--the noa topics--have dominated the literature of STS education.

This constructivist case study examines both the taboo and the noa of a STS curriculum taught in two local cultures. The primary aim of this research is to generate theory by constructing interpretations from textual data. Generalizability is not the goal of this research; the goal is to assist readers to meet their goals in the context the readers operate.

Theoretical Perspective

This interpretive study is part of an on-going, intensive research project conducted by a team of researchers with differing research interests operating under a constructivist framework. Constructivism is an epistemology that holds that individuals construct meanings from experience that are evaluated by their fit, or viability, with current and previous understandings (von Glasersfeld, 1989). The goal, therefore, of the research team is not to discover truths of the universe in which we live, but to construct viable models that fit our data. As a result, a considerable amount of raw data is included in this paper to illustrate before discussion that the interpretation presented is constructed by the researcher as a viable perspective and not discovered in the data.

Researcher's Perspective

During the planning period before meeting the participants of this study, I shared my perspective on conducting constructivist research in STS with my co-researchers. In an effort to move toward critical subjectivity--a consciousness of one's beliefs, values, and epistemologies--I share those points here that defined my conceptual system. I stated that I valued a panel of researchers, all of us offering multiple theoretical perspective--none of us holding "the" truth. My interest was in qualitative research methodology, so I offered to interpret

whatever data I collected or was shared with me through that methodology. Of prime interest to me, as a result of being exposed to Lakoff and Johnson's (1986) experiential realism theoretical lens was to focus on the local culture concept (Chairon, 1991): the experiences of individuals are constructed in a community that maintains its own belief structure. I also expressed my interest in pursuing Tobin's (1991) allusion to taboos applied to STS education.

Research Participants

Participants in this study are two science teachers in the Southeastern United States who voluntarily participated in an intensive three week summer STS inservice workshop conducted at a state university. For purposes of confidentiality, both are given pseudonyms.

The STS Inservice Experience

The three-week STS inservice experience the participant science teachers attended consisted of two components: a workshop and a field-based directed study. The workshop provided teachers with an update in scientific knowledge about the environment on a global and local scale, an introduction to the theoretical framework underlying STS and problem solving, and extensions of these ideas to classroom applications. Emphasis was placed on incorporating STS related goals and activities in the science curriculum. Special attention was focused on the design and implementation of effective teaching strategies (e.g. role playing and investigative labs) in relation to the featured environmental science topics. The field-based directed study provided teachers with opportunities to examine and apply first-hand the ideas from the workshop to selected sites in the state. The field trips were organized to help teachers relate the scientific update sessions to the development and practice of teaching skills and strategies appropriate for STS education. They were conducted so as to exemplify how teachers can locate,

design, translate, and implement field-based activities with their students.

Taboo and Noa Review and Definitions

Taboo (variations: tabu, tapu, and tampuh) is a Polynesian word that originally came from Sanskrit and meant a general priestly ban or a specific object which should not be touched (von Raum, 1973). Captain James Cook's 1771 Polynesian voyage introduced it to the English language. In its original scholarly usage, drawn from anthropological field studies of homogeneous, native cultures, taboos were defined as behaviors dangercus both to the individuals who engaged in them and to others (Knipe and Bromely, 1984). The element that distinguished taboos from other prohibitions was an element of automatic punishment associated with them. Margaret Mead put it this way: "Tabu may be defined as a negative sanction, a prohibition whose infringement results in an automatic penalty with human or superhuman mediation" (Mead, 1928). Burriss (1931) defined taboo as a feeling that certain objects, actions, or persons are, for some reason unknown to the individual, possessed of a mysterious power which makes them dangerous and should be avoided. The reason for the taboo is usually lost over time. Clifford Geertz (1983) partially distinguished humans from other animals as a result of our incest-taboo based social structure. Durkheim distinguished taboo by its strictness, its categorical nature (von Raum, 1973). Sigmund Freud (1918) made the argument that taboos, which he defined as a series of restrictions which people impose upon themselves that are forbidden without any apparent reason and which they do not think to question, expressed a fragment of psychic life which really is not comprehensible to humans.

While more current definitions of taboo vary, they have moved away from the notion of an automatic, supernatural punishment and emphasize the socially agreed upon forbidden component of taboos. It was Radcliff-Brown (1953) who led this change of taboo definition by defining taboo as a ritual

prohibition--a belief--that an infraction would result in an undesirable change in the ritual status of the transgressor through the actions of other members of the society. Schroeder (1984) made the argument that although taboos are generally thought of as irrational proscriptions (deeply ingrained traditions that once may have had reasonable meanings that have long since worn away leaving a residue of ritual behavior), some are rational--such as the silence rule in libraries. Voigt (1984) pointed out that taboos are the dark and scary side of a culture. The social aspect of taboo as describing behaviors which are universally forbidden within a given social group was furthered argued by Knipe and Bromely (1984). Thus taboos constitute an effective way for social groups to identify threatening behaviors, and having identified them, and the misfortunes which will result from them, establish grounds for controlling those behaviors. Fortes (1983) supported the social creation of taboos when he argued that they are simply examples of a special kind of rule which guides individuals' lives every hour of the day in society. Rules convey the socially authorized and sanctioned norms for the conduct of social and personal life. Von Raum (1973) argued for taboos to be placed under the rubric of restraints (restraints being defined as a limitation of a person's freedom of action or a reduction in the individual's sphere of control), with avoidance and taboo making up the ends of a continuum. Finally, Shaw and Boone (1951) argued for the consideration of levels of taboos, allowing for the word to be used for both the identification of minor forbidden behaviors and larger, more generally held societal restrictions of behavior (similar to the original meaning from Sanskrit).

The definition of taboo used in this study is a hybrid of the more current socially constructed definitions. Taboos are beliefs, both minor and more large scale, that constrain action by making those behaviors perceived as threatening by the members of the social group forbidden and improper for discussion. Taboos are constructed by the social group to control behavior

that threaten the culture's belief structure. Those STS topics that science teachers avoid teaching have been labelled taboo in this study. By not being selected for inclusion in the science curriculum, those topics have been evaluated to be improper for discussion in the classroom. In addition, the larger scale, more general ban on teaching a curriculum generally perceived as threatening in local cultures is also labelled taboo.

Noa is the Polynesian word that has the opposite meaning of taboo, i.e. things ordinary and generally accessible (Freud, 1918). The noa in STS instruction are those instructional topics that teachers generally perceive as proper for discussion in local cultures. These topics do not threaten the belief systems. In addition, the larger scale, more general acceptance of providing more interesting science instruction through a more relevant, but not too immediate, hands-on curriculum is also labelled noa.

Participants' Data

"Shirley"

Shirley is a Caucasian female approaching 30-years-old who teaches 4th grade. Before taking her present teaching position, she taught middle school science in another school district outside of the county in which her present school is located. Shirley lives outside the county her school is located and commutes daily to her school.

Data From Shirley's Perspective

During the last week of the STS workshop, Shirley completed an "Environment, Science, Technology, And Society Opinionnaire" (Appendix A) that indicated she holds the following beliefs:

Strongly believes

- the fundamental driving force in science is curiosity concerning the natural, physical universe;
- because of the great needs and serious problems we face feeding the world's population, the rate of technological development should be increased in agriculture;

• it would be better for us, our economy, and environment if less chemicals, such as those in fertilizers, insecticides, and herbicides were used in agriculture--even if that resulted in less production;

• rapid population growth is one of the major problems causing environmental degradation;

• teenage boys and girls should have the opportunity to learn various methods of birth control in school;

• critical societal problems affecting the environment should be studied in the schools even if it means less time and energy devoted to science, mathematics, English, music, and art;

• given the choice between maintaining my standard of living or using my resources to improve the environment, I choose to maintain my standard of living.

Believes

• scientific discoveries and technological inventions have, on balance, done more good than harm for human kind;

• a return to a simpler life less dependent on technology would result in a better environment for us all;

• life is better now than it was ninety years ago;

• ideally, we should consider critical societal problems that affect the environment, but that this is just not practical in our schools of today;

• there are some environment-society-technology-science issues that are too controversial to teach in my school;

Neutral belief

• it would be better for us, our economy, and environment if society were less technological;

Does not believe

• scientific discoveries make our lives change too fast;

• in dealing with environmental problems, we should heed the credo, "Nature knows best.";

• nuclear power is such an awful danger to the environment that the United States should close down all nuclear reactors;

Strongly does not believe

• the western world's technology will eventually solve the world's environmental problems.

Shirley additionally gave the following responses to four open-ended questions;

1. What kind of working definition do you hold of environment-science-technology (E-S-T-S) education?

Shirley: Where the teacher is the resource and guide in the class. The students are the implementors, searching for answers.

2. What topics do you believe should be included in a E-S-T-S curriculum at your school?

Shirley: The preservation of the environment and our natural resources.

3. Envision the "ideal E-S-T-S teacher. Describe that teacher and how that teacher behaviors.

Shirley: The teacher is nurturing and supportive. Since the students investigate problems they choose--the teacher must be flexible.

4. What E-S-T-S topics do you anticipate would be frowned upon by your school administration or community if you taught them? Would you teach them anyway--even if it meant you put your teaching job (sic) at jeopardy at your school?

Shirley: Evolution, The Big Bang, Aids (with 5th grade).

Researcher's Construction of Shirley

I first met Shirley when she was a student in the STS workshop. What stood out to me when I observed her from my teaching/researcher perspectives was her lightheartedness and relaxed summer attire, shorts and tee shirts. Shirley was assigned to me as a research participant after the workshop, at the beginning of the school teaching year. The assigning of participants was influenced heavily by geographical considerations. She was considered my geographically close participant.

The ESTS Opinionnaire data from Shirley encouraged me to pursue topics she perceived as too controversial to teach in her

community. I suspected that her list of taboo topics might stem from a local culture guided by fundamentalist religious beliefs. I was alsc struck by how many of the items in which she strongly believed. I anticipated a very confident, outspoken participant.

"ROBIN"

Robin is a Caucasian female,in her younger 20's, who teaches 6th grade. This is her second year of teaching and the first year in her present school. Robin lives outside of the county in which she teaches and commutes daily to her school.

Data From Robin's Perspective

During the last week of the STS workshop, Robin completed an "Environment, Science, Technology, And Society Opinionnaire" (Appendix A) that indicated she holds the following beliefs:

Strongly believes

- no responses

Believes

- the fundamental driving force in science is curiosity concerning the natural, physical universe;
- scientific discoveries and technological inventions have, on balance, done more good than harm for human kind;
- in dealing with environmental problems, we should heed the credo, "Nature knows best.";
- a return to a simpler life less dependent on technology would result in a better environment for us all;
- it would be better for us, our economy, and environment if society were less technological;
- rapid population growth is one of the major problems causing environmental degradation;
- teenage boys and girls should have the opportunity to learn various methods of birth control in school;
- critical societal problems affecting the environment should be studied in the schools even if it means less time and energy devoted to science, mathematics, English, music, and art;
- ideally, we should consider critical societal problems

that affect the environment, but that this is just not practical in our schools of today;

Neutral belief

• because of the great needs and serious problems we face feeding the world's population, the rate of technological development should be increased in agriculture;

• life is better now than it was ninety years ago;

Does not believe

• scientific discoveries and technological inventions have, on balance, done more good than harm for human kind;

• it would be better for us, our economy, and environment if society were less technological;

• nuclear power is such an awful danger to the environment that the United States should close down all nuclear reactors;

• given the choice between maintaining my standard of living or using my resources to improve the environment, I choose to maintain my standard of living;

• the Western World's technology will eventually solve the world's environmental problems;

• there are some environment-society-technology-science issues that are too controversial to teach in my school [although she also added the following: Grade level would prevent discussion of some topics (ex. abortion, nuclear war). Sixth grade students are not able to handle certain topics.]

Strongly does not believe

• no responses

Robin additionally gave the following responses to four open-ended questions;

1. What kind of working definition do you hold of environment-science-technology (E-S-T-S) education?

Robin: ESTS is the teaching and learning of science-technology focusing on real-world problems extending beyond the classroom to the community to develop citizenship roles in students.

2. What topics do you believe should be included in a E-S-T-S

curriculum at your school?

Robin: solid waste-recycling; habitat destruction; tropical rain forest deforestation; saving energy.

3. Envision the "ideal E-S-T-S teacher. Describe that teacher and how that teacher behaviors.

Robin: The teacher would be flexible, sensitive to students concerns, and guide students to draw their own conclusions or solutions.

4. What E-S-T-S topics do you anticipate would be frowned upon by your school administration or community if you taught them? Would you teach them anyway--even if it meant you put your teaching job (sic) at jeopardy at your school?

Robin: At the 6th grade level abortion and nuclear war would be frowned upon by school administration or community because of the age of the children. I would not teach them, however if the subject is brought up by the student it would be addressed and not ignored.

Researcher's Construction of Robin

During the STS workshop, I viewed Robin as the youngest participant. She formed a strong friendship with another female member of the workshop and was rarely by herself. I found her comments made in group discussions to be very serious and focused on her teaching role. Robin was assigned to me due to her distant geographical distance from the university.

The ESTS Opinionnaire data from Robin indicated to me that she was not a participant who took strongly opinionated stands; there were no strongly held responses. I was struck by the several references she made of her students. I looked forward to observing if she were student-centered in her teaching style. Robin's carefully thought out responses on her perceived taboo STS topics encouraged me to pursue the age issue related to curriculum selection.

Shirley's Perspective on The Local Culture

Interview Data

In a semi-structured interview (Appendix B), Shirley gave the following responses that gave me data to construct a view of her perspective on the local culture in which she teaches.

Interview Data

S (Shirley): [responding to interviewer's question on taboo topics] ...this is a rural area and there are strong ties to the community churches.... if I got into the county government and the way it is run, but that really is not science....

S: [responding to interviewer's question on thinking further on controversial topics after the workshop] And I tell the children they have to chose which theory they want to go with. I wasn't there, I didn't see it firsthand--it is all theory. And I do not go in and say this is the way it is. Because that would alienate the parents, cause problems within the school, and to me, whatever good would come of that would not justify doing that.

I (Interviewer): Is this your community?

S: No. No, but that is a conscious effort I make every year. During the summer, I send out letters to my kids that I am going to have before school starts. And I talk with my parents before school starts, and it just makes for a very easy year.

I: That is a nice tip.

S: Yeah. And I also invite parents in a lot to spent days with us. So lik' I said, I have a real close tie with my parents and the class.

Researcher's Construction of Shirley's Local Culture

I constructed the belief that Shirley held a view of the local culture in which her school was located that guided her behaviors. She thought of the area as "rural" with "strong ties with the community's churches." She also had questions concerning the ethics of the local government ["... if I got into the county government and the way it is run"]. Shirley also perceived that parents were her immediate assessors in the local culture. She consciously made a strong attempt to maintain "a

real close tie with my parents" by initiating and maintaining contact with them through letters and open invitations to the classroom. My construction of Shirley's perspective of her local culture was a community that held strong religious views in which her science teaching would be under constant scrutiny. She protected herself professionally by keeping her classroom door open for visitors and labeling threatening concepts "theories."

Robin's Perspective on the Local Culture

In a semi-structured interview (Appendix B), Robin gave the following responses that gave me data to construct a view of her perspective on the local culture in which she teaches.

Interview Data

I (Interviewer): Seeing as I do not know your county very well, could you help me out by telling me a few things about your county, your school situation and your curriculum?

R (Robin): Um, the school is the middle school, that is 6th through 8. The community, I do not know a whole lot about it because I do not live here. I, from what I've seen, the community, the parents, they seem to be very supportive and interested in what is going on in their children's classrooms. We try to do, anything that we do that could be put in the paper, we let the parents know. The school's administrators are very supportive. They like for a lot of, my principal likes a lot of hands-on, he was a science person so he likes a lot of hands-on in the science area. We do not have a lot of the lab equipment that we need to do a lot of these activities. A lot of the equipment I have is what I bought--like this summer; I spent more money on books.

I: In this community, how do most people make a living?

R: Um, they have a ... it's [omitted]. All I know is [omitted] or something like that. It's [omitted] here; that is a big industry. There are some other industries in [a neighboring town]. [This county] is made of [names omitted of towns]. And there may be another one, I am not sure because I do not know

much about it. But there is some industry in [one town] that I do not know something about. There isn't any big industry like there would be in [a large city]. It is just a small town community.

I: Thinking of your particular students, do you have some idea how their parents make a living?

R: A lot of them work at [industry mentioned above]. Some of them work at the bank; some of them are teachers. I have one little girl, her daddy is the preacher. And then I do have some children whose parents drive to [Robin's town] to work--not all of them work in [this county].

I: One thing I was struck by as I drove in today was the number of lumber trucks and, as you say, the yard products stores. Is that the dominant industry?

R: I believe so. They do a lot of logging around here. It may not be big logging industries, just small logging industries. Oh, something that draws a lot of people is the [state park] national park, no state park. That is another thing we are planning to do at the end of the year. We are going to go out and do various activities at the park. One of my children's mother works at the park and she has agreed to help. I have a lot of parents that will help.

I: , [asking questions about controversial topics] Being an outsider, can I ask you why would that water situation possibly cause your job to be put in jeopardy if you answered those questions?

P: Just for being an outsider. Cause, I know, in this area, it is like everybody knows everybody. And like I know when eve we move from [omitted] to [omitted] everybody is supposed to know everybody. And if you are not related to somebody, you are a nobody. And what you think does not matter because you weren't born here.

Resea cher's Perspective on Robin's Local Culture

Robin viewed herself as an outsider in a local culture that viewed her as a "nobody." Her opinion did "not matter" because

she wasn't born there. Robin saw the local community as a tightly woven group of people who were "supposed to know everybody." She perceieved her students' parents as interested in what happened in her class and often sent home reports of anything that "could be put in the paper." She viewed her principal as supporting a hands-on science program since he was "a science person." Since the school did not supply her with much equipment, Robin had purchased "[a] lot of the equipment" to teach in a hands-on style. Robin thought most of her students' parents worked in the local culture's primary industry, a wood products factory. I constructed that Robin thought of the local culture as very similar to the local culture in which she lived. The difference being that in this local culture, Robin had no community identity and, therefore, needed to be careful in her teaching actions that related to local issues.

Shirley's Perceived Taboos

In a semi-structured interview (Appendix B), Shirley gave the following responses that gave me data to construct a view of her perspective on those topics she perceives as too controversial--taboo--to be taught by her in her local culture.

Interview Data:

I (Interviewer): Did those questions [ESTS Opinionnaire #17 and Essay 4] cause you to think further on this topic as it affects you and your teaching?

S (Shirley): Yeah. I think there is so much that can be taught and there are some issues that fall in the gray area where there really... you really won't get in trouble for teaching them. And those I would have no trouble doing. But I feel like the trouble that would be stirred up by hitting something extremely controversial would take away from...for me it would take away so much energy to try to defend, and the problems it would cause would take away from the intent, or the reason for teaching them. Like, I put down on here [questionnaire] Evolution, the Big Bang theory as opposed to the Biblical creation. I teach

those, and I have in the past, I teach it as a theory, and I also say there are other theories-a biblical theory. And I tell the children they have to chose which theory they want to go with. I wasn't there, I didn't see it firsthand--it is all theory. And I do not go in and say this is the way it is. Because that would alienate the parents, cause problems within the school, and to me, whatever good would come of that would not justify doing that.

I (Interviewer): Perhaps you can tell me what has been going on since the workshop? You were mentioning when I came here about the right whale. Do you have any other S-T-S things that you would like to share during this quarter?

S (Shirley): Well, it is relatively early in the year but they were very concerned at one time with the water quality up here in the county. For a few week we monitored the water from different sources. We did experiments on the water and it all proved out all right. There were concerns because of what had come out in the paper, you know, the pollution and Lake Lanier and all that stuff. The testing kits I had available we only tested for ammonia and chlorine and we did not really go into a lot of bacteria [both S and I laugh]. But the water passed. We did test the hardness of the water and that kind of stuff. And then they, uh, what did they get concerned about next. Oh, they got concerned about them cutting down trees, the county was cutting down trees, we had to find out about that because they were cutting down their oxygen and they took it very personally [laughter]. Their oxygen supply!....You know, I present them with information, and if they want to act on it independently, you know there is not anything I can do about that. And I make sure that I present them with facts; I do not give them my opinions.

I: Can you anticipate any areas that might get uncomfortable?

S: When we were getting into the water samples, I was starting to get concerned. And when the kids wanted to know about this right here, the woods being cut down, the county was doing that!

My employer was doing that [laughter] you know. And they were concerned because the county was clearing land right in front of the fire department, and they were burning it, you know! But what I did for the kids was find out the facts and presented it to them and that was that. There wasn't any pickets or anything like that. And the water sample, you know, that can get kind of ...But luckily it turned out fine. But I let the kids go with it; I did not push them, and I did not stop them. I just informed them. And luckily for me, they all (inaudible).

I: As a follow-up to that at which point would you have stopped them, if it got really uncomfortable to you?

S: (long pause) [repeats question-At which point would I have stopped them?] (pause) I think probably if I felt like the end would not have justified the means. I mean, like them writing letters or getting upset because of the cutting down of those trees, the trees were already gone, you see what I am saying, they would not have made a difference. That is a hard question! I don't know at what point I would stop them and I don't know that if I would. You know, I present them with information, and if they want to act on it independently, you know there is not anything I can do about that. And I make sure that I present them with facts; I do not give them my opinions. And I think that safeguards me from a lot of controversy like that. You like with the burning of the woods down here. I just told them just what is going on. They ask me, I just told them what is going on. If they and their parents want to go and do whatever, they is fine. I wasn't going to have them organize that.

I: If you intentionally wanted to put your job in jeopardy at the school you teach in presently, which potential topics in E-S-T-S would you include in your curriculum?

S: You mean if I wanted to try to get them to fire me?

I: Intentionally put your job in jeopardy....

S: Probably AIDS in 4th grade. I think they need to know it but I do not think I need to take class time and teach a unit on it. And I think that would probably get several people upset. I do

not think that is necessary, but.... And if I went at the evolution theory in 4th grade, this is a rural area and there are strong ties to the community churches, and I think that would probably cause...and if I wanted to teach sex education, but I really do not see that as being S-T-S, but something like that-I could have hands-on [laughter]. I'll tell you, if I got into the county government and the way it is run, but that really is not science....

I: Do the community and school share your definition of what are taboo (forbidden topics) to teach in e-s-t-s?

S: I think so. I have a real close tie with my parents and my children.

I: Is this your community?

S: No. No, but that is a conscious effort I make every year. During the summer, I send out letters to my kids that I am going to have before school starts. And I talk with my parents before school starts, and it just makes for a very easy year.

Researcher's Construction of Shirley's Taboos

I developed a model of Shirley as employing a cost-benefit analysis of STS curriculum selection. Shirley looked at the "end result," and not the process. Energy was her currency. If a topic "stirred up" the community too much and impinged on her teaching world, the topic was too costly to teach. Her rationale in deselecting controversial topics was that her teaching time was limited and there were many other noa topics that she could teach instead.

Two particular taboo STS topics Shirley had found herself in were an examination of the community's water supply and tree cutting by the county, "her employers." Although Shirley did not overtly forbid discussion of those issues in her science classes, she simply gave the "facts", not her "opinions" and did not encourage student "picketing" through "organizing" the students around controversial community issues. Shirley also defined AIDS, evolution, and sex education as taboo STS topics in her local culture. Her rationale was that the community was rural and had

strong ties to the community churches. She also asserted that the age level of the students justified not teaching them those taboo topics.

Shirley's Perceived Noas

In a semi-structured interview (Appendix B), Shirley gave the following responses that gave me data to begin constructing a view of her perspective on those topics she perceives as appropriate to be taught by her in her local culture.

Interview Data

I (Interviewer): Perhaps you can tell me what has been going on since the workshop? You were mentioning when I came here about the right whale. Do you have any other S-T-S things that you would like to share during this quarter?

S (Shirley): Well, it is relatively early in the year...[students] want to get into the dolphin thing since they adopted a whale. They will keep us posted about the progress of our whale, the sightings. And we can chart them. And they want to do something about the dolphins....You know, I present them with information, and if they want to act on it independently, you know there is not anything I can do about that. And I make sure that I present them with facts; I do not give them my opinions

I: But if you wanted to teach another topic that is not exactly on it [the county curriculum], how would you decide if it were appropriate?

S: (pause) By how beneficial it would be to the child's life, period. You know, whales really aren't on our topic. That is not really a unit that we have. But, that, I feel, will help foster that responsible citizen in all my kids, you know. So I have to rationalize it in my own mind as to my goal that I have for my kids, which I want them to be well rounded and I want them to take responsibility for their environment and for their world. Because we are leaving them a mess, and that is what I tell them all the time.

Researcher's Construction of Shirley's Noas

Studying whales and dolphins, two popular and non-threatening STS topics in her hinterland local culture were examples of noa topics supplied by Shirley. Shirley selected them to be infused in her county's curriculum due to her perspective that they "foster[ed] responsible citizens in all [her] kids". She wanted her students to be "well rounded" and to take an interest in the environment (although Shirley felt as though the students were being left a "mess").

Robin's Perceived Taboos

In a semi-structured interview (Appendix B), Robin gave the following responses that gave me data to begin constructing a view of her perspective on those topics she perceives as too controversial--taboo--to be taught by her in her local culture.

Interview Data

I (Interviewer): ...Had you thought about the issue of controversial topics in E-S-T-S instruction before you answered those questions?

R (Robin): Yes, but not in as much detail as we talked about them in class. [pause] I hadn't thought about the way in which we use them. I remember being in school and all we would do is bring in a little article and you would give a little summary of the article and that was the way you studied controversial issues. And things going on in the news.

I: Well, which topics do you think might be frowned upon for you to teach in your teaching context?

R: I am not really sure. I am not so sure they would be frowned upon. It is just that I am not sure my 6th graders would be able to handle some of the discussion--like abortion. Except, I do have a little boy who wants to do his science fair topic on abortion. So, but, that was his choice. Um, you have to watch how much detail you go into with 6th graders. I think nuclear war is something you could not go into much detail with children

because for one thing, it would be up over their heads, the language. And two, you do not want to scare them. I know a lot of them got scared when you went to Saudi Arabia and you had the Desert Storm and Desert Shield so you have to watch what you talk about. You do not want to scare them and make them paranoid.

I: Have you reacted to controversial topics brought up by your students? I think you mentioned something along the lines earlier about abortion.

R: Well, they haven't really brought up the abortion as of yet. Except for the little boy. He's doing, and I helped him, I met him in [deleted] at the library, and I helped him find information. And I asked him if he realized that was sort of a peculiar topic for a boy to be doing. And he said yes. And I said that I just want you to know that is your choice. And when his daddy came to pick him up and I was talking to his daddy, and his daddy said, "That is kind of a peculiar topic" and I said yes sir, but I want you to know that was his choice, I did not even suggest it. He came up with that topic on his own. And he said, well, it didn't matter to him what he did just as long as he was learning something. So, I didn't tell the little boy to do the topic....

I: Since you mentioned 6th grade in particular, what do you do to decide which topics will scare them or which ones will not scare them?

R: I do not know. I guess I would have to think back when ever I was a kid in the 6th grade. What would have bothered me? Talking about something that scared me, I remember this happened long before the 6th grade but I do not know where I got this from, but we talked about the weather and tornadoes and for the longest time I was paranoid anytime a cloud came up. And this went on up until I was in the 5th or 6th grade and when ever a cloud would come up I would go to pieces because I thought a tornado was coming and it was going to take me away. So you have to, no matter what age, you have to be careful how you discuss a topic with them. Because even now, we talked about, I noticed

some of my children, we talked about, we haven't really gotten into space but they asked about it once in a while, they asked "Will a comet come and hit the Earth?" You have to be careful about how you talk to them. You talk to them about comets and meteors and dinosaurs, we talked about dinosaurs and how a comet, I believe it was a meteor, hit the Earth and they believe that might be one of the reasons dinosaurs became extinct. Well they were so afraid that one was going to come and hit the Earth and make humans extinct. So you have to be careful what you discuss with them.

I: If you intentionally wanted to put your job in jeopardy at the school you teach in presently, which potential topics would you include in your curriculum? This is what I call going out in a blaze of fire!

R: [thinking out loud] Quit my job, put my job in jeopardy.... Well it may be like I was talking about, jumping on the water situation. We have a problem here with the water in which the water turns brown or it is brown. And it might be if my children started investigating to find out it might cause a stir in the community and in the school. I would hope I would not lose my job over it, but that could be something.

I: Being an outsider, can I ask you why would that water situation possibly cause your job to be put in jeopardy if you answered those questions?

R: Just for being an outsider. Cause, I know, in this area, it is like everybody knows everybody. And like I know when ever we move from [omitted] to [omitted] everybody is supposed to know everybody. And if you are not related to somebody, you are a nobody. And what you think does not matter because you weren't born here.

I: Well, can you think of any other things beside the water situation that would distinguish you as an outsider and cause you problems if you brought them up or if the students brought them up and you allowed them to investigate it?

R: No, not at this moment. I am sure that there are some, I just

cannot think of any. If we did something with the farm land, that might cause some problems because you have the farmers and they might get into an uproar.

Researcher's Construction of Robin's Taboos

Robin had two bases for deselecting STS topics. She used her students' ages and her concern with local issues as determinants of taboo topics. Abortion and nuclear war could "scare" her students and potentially make them "paranoid" due to their age. Robin also saw getting too involved in investigating the local culture's resources, the water and the farmland, as taboo topics. Teaching those topics could "cause a stir in the community" or "an uproar." Robin also was on her guard when teaching any topic that might be broadened by her students to include concern for their own safety, e.g. a comet hitting the earth and destroying humankind.

Robin's Perceived Noas

In a semi-structured interview (Appendix B), Robin gave the following responses that gave me data to begin constructing a view of her perspective on those topics she perceives as appropriate to be taught by her in her local culture.

Interview Data

I(Interviewer): Where do you see S-T-S being placed in your curriculum?

R(Robin): That's hard. I've been trying to figure out for the past two weeks where exactly I teach S-T-S. I do not think of it as one particular subject--we stick it in where ever it becomes necessary. It is all through out our curriculum. Like this particular chapter is animal adaptation. We've done our little birds; we've done our birds with special adaptations. We've played with earthworms. We work it in where ever we can.

I: And from your exposure to the class, how do you see them [cut out articles brought to class by students] being used now that

is different?

R: Like I had not really thought about it until I sat down to talk with you about the water situation and having someone come in but I've been trying to figure out some classroom guests we could have so I need to get in touch with someone here in [omitted] and get someone in here to talk about the water. Also, I remember some one told me, and I do not know if you can see it in the actual water, the little, cyclops, I think. Now I do not know if that is in the city water or just in the ditch. I know some of my children brought in pond water and ditch water and that is another activity we did. Ditch water, pond water, and one little boy brought in water from his dog's bowl, and we looked to see what kind of things we could see with the naked eye. I tried putting things under the microscope but our microscopes are not powerful enough to see anything. So we just looked with the naked eye. And it was funny to see what all they could find. Then they took soil and all the different things they could find in it. Trash or whatever. What we did was classify living or nonliving and they would say what are these little things swimming around in there. And I would say I do not know, but list it as living and put it, if it was black, if it was a worm, as black worm under living in water. But that water they got to see things living in water and dirt because a lot of them did not realize that there is a lot of trash that was buried in the dirt. The little cyclops in water, or in all different kinds of things.

Researcher's Construction of Robin's Noas

Robin felt that the noa STS topics were those topics that added a creative and hands-on component to the county's science curriculum. Playing with earthworms was one noa topic that she provided. Another was an examination of water--as long as it was water in general and not related to the local culture's water supply.

Discussion

The aim of this research study was to construct viable models of the taboos and noas of STS topics taught in two local cultures. Extensive raw data was presented to illustrate that the interpretation presented by the researcher was constructed, not discovered. The researcher's conceptual system was revealed to promote critical subjectivity--a consciousness of one's beliefs, values, and epistemologies.

Taboo STS topics identified in the local cultures differed. That was expected since the local cultures are maintained by idiosyncratic belief systems. One local culture was perceived by the teacher to be distinguished by a strong religious belief system. Topics considered to be taboo were AIDS, evolution, and sex education. All of these topics have typically been sensitive in fundamentalist communities. Other topics considered to be taboo by the same teacher were an extensive student investigation of the local water supply and tree cutting by the county. The participant considered the danger of arousing censure by her employers to override the educational value of students becoming involved in a relevant local STS issue.

Topics perceived to be taboo by the other teacher in a different local culture were abortion and nuclear war. She considered them to be inappropriate due to the age of her students. In addition, the teacher perceived getting too involved with investigating the local culture's resources (e.g. water and farmland) as taboo topics.

In both of the participant's cases, the teachers were outsiders to the local culture in which they taught. From the data collected, I interpret the teachers' reluctance to teach controversial local STS topics as being influenced this condition. As outsiders, both felt vulnerable to censure if they went against the local culture's belief system.

The noas of teaching STS in the first participant's local culture were studying whales and dolphins. The noas of teaching STS in the second participant's local culture were topics, such

as creating imaginary animals and playing with earthworms, that added a hands-on component to the curriculum. In both cases, the noas were topics that did not threaten the local culture's belief system.

Advocates of STS education in science make the argument that students benefit by actively getting involved in local, relevant, and, oftentimes, controversial societal issues. This case study, however, asserts that some controversial topics are perceived by some teachers to be taboo in their local cultures and are not taught. Further research using other participants with different characteristics (e.g. tenure and residence in local cultures) that uses the methodology demonstrated in this study is recommended to provide greater insights in the rules of conduct teachers live by. Implications for teacher education programs through these insights are manifold and under consideration.

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Appendix A

Name _____

Opinionnaire

Environment, Science, Technology, And Society

The following are statements about the environment, science, technology, and society. On the separate sheet provided, please darken in the response that best approximates your position on the statement. Please indicate your reason(s) for selecting your response under each statement in the space provided on this opinionnaire.

Format:

Statement strongly agree(SA) agree(A) no opinion(N) disagree(D) strongly disagree(SD)

1. The fundamental driving force in science is curiosity concerning the natural, physical universe. (SA) (A) (N) (D) (SD)

Comment:

2. Scientific discoveries and technological inventions have, on the balance, done more good than harm for humankind. (SA) (A) (N) (D) (SD)

Comment:

3. Scientific discoveries make our lives change too fast. (SA) (A) (N) (D) (SD)

Comment:

4. Because of the great needs and serious problems we face feeding the world's population, the rate of technological development should be increased in agriculture. (SA) (A) (N) (D) (SD)

Comment:

5. In dealing with environmental problems, we should heed the credo, "Nature knows best." (SA) (A) (N) (D) (SD)

Comment:

6. A return to a simpler life less dependent on technology would result in a better environment for us all. (SA) (A) (N) (D) (SD)

Comment:

7. Life is better now than it was ninety years ago. (SA) (A) (N) (D) (SD)

Comment:

8. It would be better for us, our economy, and environment if society were less technological. (SA) (A) (N) (D) (SD)

Comment:

9. It would be better for us, our economy, and environment if less chemicals, such as those in fertilizers, insecticides, and herbicides were used in agriculture--even if that resulted in less production. (SA) (A) (N) (D) (SD)

Comment:

10. Rapid population growth is one of the major problems causing environmental degradation. (SA) (A) (N) (D) (SD)

Comment:

11. Teenage boys and girls should have the opportunity to learn various methods of birth control in school. (SA) (A) (N) (D) (SD)

Comment:

12. Nuclear power is such an awful danger to the environment that the United States should close down all nuclear reactors. (SA) (A) (N) (D) (SD)

Comment:

13. Critical societal problems affecting the environment should be studied in the schools even if it means less time and energy devoted to science, mathematics, English, music, and art. (SA) (A) (N) (D) (SD)

Comment:

14. Ideally, we should consider critical societal problems that affect the environment, but this is just not practical in our schools of today. (SA) (A) (N) (D) (SD)

Comment:

15. Given the choice between maintaining my standard of living or using my resources to improve the environment, I choose to maintain my standard of living. (SA) (A) (N) (D) (SD)

Comment:

16. The Western World's technology will eventually solve the world's environmental problems. (SA) (A) (N) (D) (SD)

Comment:

Questions:

1. Had you thought about the issue of controversial topics in E-S-T-S instruction before you answered those questions?

2. Did those questions cause you to think further on this subject as it affects you and your teaching?

3. Which topics do you anticipate might be frowned upon for you to teach as E-S-T-S topics in your teaching context?
   (probe: Which of these topics would you teach anyway?
   Do you teach them in any way different from other topics?
   Have you ever received complaints about any topics relating to E-S-T-S that you taught? Would you teach those topics again?)

4. How have you reacted to controversial topics brought up by your students?

5. If you intentionally wanted to put your job in jeopardy at the school you teach in presently, which potential topics in E-S-T-S would you include in your curriculum?

6. Has your involvement with E-S-T-S instruction (as a result of the workshop, further thinking, etc) changed your thinking or viewpoint about what subjects might be too controversial or "taboo" to teach in your class?
   (If the participant asks what taboo means, say it refers to a topic in E-S-T-S which is considered forbidden to be discussed in their classroom.)

7. Do the community and school share your definition of what might be "taboo" topics to teach in E-S-T-S?
   (probe: If no, ask which ones differ and how.)