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Author: Herbert, Susan

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Email: info@mlrg.org

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by
Susan Herbert

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Susan Herbert

School of Education

University of the West Indies

St. Augustine

Republic of Trinidad and Tobago.

email: herbert@educ.uwi.tt

Date Completed: 5-30-97.

Introduction.

There is a small but growing number of studies in which traditional or indigenous practices and beliefs are the subject of research (Baimba, 1993). Other researchers, for example, George (1993, 1995), have made a strong case for the inclusion of such practices and beliefs in the science curricula of developing countries. This call is strengthened by the recent orientation towards more student-centered curricula which are hinged on the view that students are actively making sense of the phenomena they encounter. Specifically, the inclusion of traditional practices and beliefs in science curricula is congruent with a major current view of learning, which argues that the learner is actively making sense of their observations of persons, objects, and events, and that these meanings are influenced significantly by the social / cultural milieu of the learner (Solomon, 1987; Cobern, 1994).

It is now widely recognized that students have out-of-school experiences for which schema are established, and these schema act as filters for new in-school experiences. In other words, it is accepted that the students enter the classroom with schema which reflect their understandings of past experiences. Consequently, there is the emerging view in developing countries that the inclusion of traditional or indigenous practices and beliefs as a teaching strategy in science could make access to school science easier for some students.

Educators who subscribe to the theory that students are constantly constructing meanings believe that the students are continually engaged in the process of modifying, and expanding their prior concepts. Since traditional practices and beliefs provide fundamental concepts by which some individuals in Trinidad and Tobago conduct their lives, it is incumbent upon science educators who address issues like health and nutrition to understand the principles by which the students conduct their lives outside of the formal science classroom, so that links can be forged. It is proposed that this understanding is a prerequisite for science curriculum development in aspects of health and nutrition at the lower secondary level (ages 11-15 years), since this is the stage at which these topics are typically introduced.

The work reported in this paper represents the initial phase of a larger project, and is an attempt to (i) determine the traditional practices and beliefs which guide the actions of a group of 11- 14 year old students in aspects of health and nutrition, and (ii) understand the principles that underpin traditional

practices and beliefs which are related to health and nutrition in Trinidad and Tobago, West Indies.

The rest of the paper is organized around four main themes. The section entitled "Ways of knowing" introduces the concept of multiple worlds, and describes the background to the study. In this section, it is argued that educators must know, and understand the students' worlds in matters that relate to the topics which are addressed in class. This section is followed by a discussion of philosophical issues and methods- the guiding philosophy, the case, and the methodology that was used in implementing the study. The findings are then presented, and in the final section of the paper, there is a discussion of the findings, and some implications for science curricula in health and nutrition in the context under study are presented.

Ways of knowing

The use of children's ideas as the subject of research is essentially a 20th century phenomenon. It has been established that students do come to the classroom with theories about their experiences, and that these theories are usually quite different from those that are presented in the formal science classroom. These theories have explanatory and predictive power for the students, and they guide the observations which are deemed worthwhile. They can be said to constitute the ways of knowing which delimit the students' worlds. Different explanations of similar occurrences are exhibitions of different ways of knowing.

Phelan, Davidson and Cao (1991) described the students' daily experiences in the family, the school, and among their friends as experiences of multiple worlds. These worlds comprise the attitudes, values, beliefs, expectations and actions which are common to the family, the school, or the peer group. Phelan et al. posit that students may move among many worlds during the day, and, as a result, they are continually negotiating the boundaries between these worlds. Costa (1995) found that the greater the degree of congruence between their in-school and out-of-school experiences, the more positive are the students' attitudes towards school science.

In a developing country such as Trinidad and Tobago, traditional practices form a substantial part of the everyday experiences of some children. It, therefore, seemed logical to explore aspects of these practices and related beliefs, in order to understand the boundaries that students might have to cross in order to access the conventional science with which they are presented in school.

Traditional practices and beliefs

The word "traditional" is used to describe the practices and beliefs which are considered to be part of the wisdom which has been passed on over a number of generations, from parent to child, in an oral fashion, and which constitute an integral part of contemporary life for many people in developing countries. These practices and beliefs are valued in the community and serve as prior knowledge for some secondary school students.

Cognitive psychologists subscribe to the view that learning is an active process in which the learner makes sense of observations, that is, constructs meaning. They propose that learning takes place when concepts are expanded and / or reorganized, and, in the tradition of Ausubel, they believe that prior knowledge is an intrinsic component of this process. This knowledge has been described in the literature as "misconceptions", "alternative frameworks", "commonsense conceptions", "untutored beliefs" and "preconceptions" (Driver & Easley, 1978; Gilbert & Watts, 1983; Hills, 1989; Smith, 1994). Initially, I thought of this knowledge solely as misconceptions which had to be corrected. It was the term "street science" (George & Glasgow, 1988) that facilitated my recognition of traditional practices and beliefs, with their concomitant values and structures, as constructed understandings of phenomena. This term also triggered my quest to understand the principles which govern the students' actions and their explanations of the phenomena which they encounter.

School science

School science curricula are formulated and implemented without any reference either to the culture of science, or the students' worlds (Phelan et al. 1991; Layton, Jenkins, Macgill & Davey, 1993). In other words, it is a common occurrence that the content and structure of school science remain constant, though the context in which it is taught changes. It is, therefore, not surprising that science is often presented in school in a manner which excludes the traditional explanations of phenomena. But, traditional practices and beliefs are an intrinsic part of the everyday lives of many persons. If the principles which underpin traditional practices and beliefs are quite different from those of school science, then, it is plausible that some students may not be successful at school science because these conceptual barriers are insurmountable, and they are unable to cross the boundary between their everyday world and the world of school science.

George (1995) found that some words, for example, "heat", may have different meanings in conventional science and traditional wisdom. In traditional wisdom, the word "heat" may refer to the intrinsic state of the human body; in conventional science, the term "heat" refers to the process of thermal energy transfer from one body to another. George also reported that some principles of traditional wisdom are not found in conventional science. The "hot/cold" principle is one example. The "hot/cold" principle which states that a hot human body should not be exposed suddenly to cold temperatures (George, 1995) is not found in conventional science. It is argued that these differences may impact on the students' ability to access conventional science concepts, and if the students are unable to access the concepts which are presented in school science, then these concepts will have no relevance for their everyday lives.

It may be that traditional practices and beliefs can be used as a bridge between the everyday experiences of the child, and the concepts which are presented in the formal science classes. As an initial requirement for the development of such curricula, the principles which guide the students' actions in everyday life must first be understood. It is only through this understanding that differences and similarities between the principles of everyday practices, and those of school science can be made explicit, and thus be used to provide the scaffolding that some students may need so that they can access school science concepts.

Guiding philosophy

The philosophy of constructivism underpins this study. Constructivists believe that all knowledge is an approximation of reality. They advocate that knowledge is created by persons, who, in attempting to describe and explain phenomena, are influenced by personal and societal circumstances. In particular, the study is guided by Cobern's (1994) concept of "cultural constructivism." Cobern proposed that people engage in making sense of that which is meaningful to society. In Trinidad and Tobago, the traditional way of life provides meaningful concepts which guide the actions of some people. This study explored this phenomenon in a class of 11 - 14 year olds in an urban secondary school in the capital city of Port- of- Spain, Trinidad.

The case

The case comprised a group of thirty -six (36) students in an all girls' secondary school. The students entered the school in September 1996, and are a truly heterogenous group in many respects. They came from primary schools which are located throughout the country, though most attended primary schools in the northern, western, and eastern parts of Trinidad. As can be expected, their background experiences in science are varied, and their attitudes towards the subject range from highly enthusiastic to mildly interested. They also represent diverse socio-economic backgrounds and ethnicities.

An investigation into the students' knowledge of, and commitment to traditional practices and beliefs in aspects of health and nutrition was done by means of a questionnaire, followed by focused, semi-structured, one-to-one interviews.

Methodology

This case study falls within the qualitative research paradigm. Grounded theory methodology was employed to determine the principles which underpin the traditional practices and beliefs which guide the students' actions in aspects of health and nutrition.

Grounded theory methodology has been defined by Strauss and Corbin (1994, p.273) as "a general methodology for developing theory that is grounded in the data systematically gathered and analysed. Theory evolves during the actual research, and it does this through continuous interplay between analysis and data collection".

Two main data collection procedures were used -a written questionnaire, and focused, semi-structured, one-to-one interviews. The questionnaire was the first data gathering device used. The questionnaires were distributed to the sample of 11- 14 year old students, and the responses were analysed by grounded theory methodology, that is, the data were coded and categorized, and the related categories were clustered so that general hypotheses and principles could be induced. The analysis of the data revealed the students who were knowledgeable of, and committed to traditional practices and beliefs.

The second data collection procedure- the focused, semi-structured, one-to-one interviews- was conducted with the students who were identified as being committed to the traditional practices. The data generated in the interviews were also subjected to grounded theory methodology, and reflections on each interview led to modifications of subsequent interviews. The data collection and data analysis procedures were intertwined at each stage of the process.

Data Collection and Analysis

Instruments

The questionnaire was made up of 24 items which described a variety of everyday situations in aspects of health and nutrition. It contained a mixture of two main types of items - the multiple choice item, and the free response type. The multiple choice items contained a mixture of traditional practices and beliefs, and conventional science responses from which students chose. The free response items gave the students the opportunity to supply explanations for everyday practices, and / or suggest the actions that they would take, in response to some everyday phenomena.

Six of the items were obtained from a questionnaire which was constructed by George (1991), and which had been piloted on students from two rural high schools in Trinidad. The other items were developed by this researcher from a combination of literature searches, my own experiences, and discussions with my family and colleagues. The questionnaire was subjected to peer review, and was piloted in March, 1996 on two groups of 11-14 year old students. These students attend the same Port -of- Spain school in which the study was conducted, but were not involved in the study. The analysis of the responses revealed some flaws in some of the items. The faults were corrected, and the final version was administered to the students who comprised the case in April, 1997.

Would you obey your mother if she told you that you should not walk barefooted on a cold floor as soon as you awoke?

A. Yes

B. No

Give your reason.

The students' scores for each item were placed on a master sheet. The students were identified as steeped in the traditional practices and beliefs, if at least seventy percent (70%) of their responses were based on the traditional practices and beliefs.

The analysis revealed that there were ten (10) students who were steeped in traditional practices and beliefs in aspects of health and nutrition. These students were interviewed using a focused, semi-structured format, and all interviews were audiotaped. The interviews began with the issues which were based on the students' responses to the questionnaire, and each interview was allowed to develop naturally. The interviews were transcribed, and were used to explore more fully, the students' commitment to the traditional practices and beliefs in the domain of health and nutrition, and to gain greater insight into their family practices. The guidelines of grounded theory methodology were used to analyze the responses in order to clarify the principles, and to establish the organizing frameworks of the students in the area of health and nutrition.

The rest of the paper reports, in the main, on the meanings extracted from the interview data.

Findings

The findings indicate that the students engage in practices and beliefs which incorporate both traditional wisdom, and the modern Western approaches to aspects of health and nutrition. It was also observed that students relied on authority (parents, doctors, elders) for their decision making, and many students could not give detailed explanations for their actions. When personal experiences were used in decision making, the parent was also a factor in the decision.

Generally, it can be said that all of the students use explanations which are based on traditional practices and beliefs in some aspects of health and nutrition. The main systems which emerged, and which constitute the traditional approaches to health and nutrition are those actions and beliefs which govern (i) the interaction of the human body with the environment, and (ii) the accumulation of wastes in the human body.

Interaction of the human body with the environment

Traditional wisdom is most prevalent in actions which revolve around the interaction of the human body with the environment. One of the principles in traditional wisdom which governs a person's interaction with the environment has been described as the "hot/ cold principle" (George, 1995). In essence, this principle governs actions which are taken to ensure that the "heated" human body is not exposed suddenly to cold temperatures.

The analysis of the responses from the questionnaire revealed that twenty-four (24) out of the thirty-six (36) students (67%) believed that both they,

and other people would catch a cold if they walked on the cold floor, or took a cold shower as soon as they awoke. Only one student was not definitive in her answer about herself, and she responded: "I don't know". Eleven(11) students (31%) did not think they they would catch the cold in this way.

Thirty-three (33) of the students (92%) thought that other people could catch the cold in this way. Six (6) of these thirty-three believed that other people would catch the cold, but they would not. Thus, while these students have not applied the hot/ cold principle in explaining how they might have contracted a cold, they do not refute the possibility that those conditions may cause other persons to become ill.

The interview sessions all began with an initial statement such as: *Today we're going to talk a little about the information that we got on the questionnaire. You said that walking on the cold floor, or going to the cold shower as soon as you got up from sleeping would give you the cold. Can you explain that for me?*

In general, the students believe that the human body becomes heated as a result of sleeping, and that the sudden mixing of the two temperatures is not good, so illness occurs :

S.G.... when you now wake up your body is warmyou'll get the cold, cause when the two temperatures meet....

K.Y. when you wake up, your body, ...it might have a little heat in it.....When the heat and cold mix, that could cause the cold.

K.M. The mixing of the temperatures. It's a human body, and if you change the temperatures suddenly, you might get sick.

The students also indicated that the human body may become "hot" as a result of two different sets of circumstances. As mentioned previously, the normal body processes, for example, sleeping, is one means by which the human body becomes heated. But the heated state may also result from the exposure of the body to thermal energy. A number of examples of everyday situations in which the body is exposed to thermal energy, the actions which will lead to illness, and the preventative measures which must be taken, were obtained in the interviews :

Y.P. "When you just came, like let's say you came out from the sun. You were outside planting or something, and you just poke your head inside of the refrigerator one time. That can also give you a head cold. But, the cold in general, but mostly a head cold."

S.G. "My mom's a hairdresser, she keeps the iron comb. She turns on the stove and keeps the iron comb on the fire. So she uses it to straighten the hair instead of chemicals, and after pressing, you cannot go to the fridge for a while".

J. M. "When the shoes and socks are removed, you should wear slippers and take a while before exposing the feet to water".

The result of the unwise mixing of temperatures varies from the cold, to fever, to a stroke :

N.Q. "Well, when you sleep, your body's hot, so as soon as you wake up and you go on the cold floor or the shower, the temperature change in your body too fast, and that might cause a fever or so."

J.M. "Well, when you get up right, it's a kind of cold environment, so I think when you go in the bathroom just so, you can get some kind of stroke or something like that. And when you're walking on the cold floor, and sometimes you come home, and you have on you shoes it's warm inside your feet. So when you just go on the cold tiles on the bathroom floor, you can get a stroke or something so."

When the students were asked to explain why persons who were exposed to these situations would become ill, the responses all reinforced the idea that the sudden exposure of the heated human body to a cold environment would result in illnesses :

S.H. What causes you to get the stroke or so?

J.M. Well, I say like the changing of the temperature so quickly, can cause you to get that. Your body is not adapted to that sort of temperature.

A.B. it's likeprobably the sudden change in temperature. Because you're asleep, your body temperature is warmer. And then from when your body is all warm, and then you go and walk on the cold floor. That probably affects you.

The students described strategies which are used to manage their interaction with the environment, and hence prevent illness. These strategies are adopted so that the body can adapt to the temperature of the surroundings. The following preventative measures were given : (i) always wear slippers when walking on the cold floor after waking, (ii) do not wet your body with water if your body is warm, and (iii) do not immediately wash the feet after taking off shoes.

The last two preventative measures illustrate the impact of water on the human body. Generally, the students believe that if they are exposed to water for a prolonged period, then they are likely to catch the cold:

S.H. Are there any other precautions that you would take to prevent the cold?

A.B. ...If you are watering the plants with the hose, try not to get your feet wet, and leave it wet for long.

S.H. You have to dry it off quickly?

A.B. Yes miss.

S.H. That could also give you the cold?

A.B. My brother gets the cold. Everytime he washes down the garage, he always ends up with a cold afterwards. He likes to play in the water.

K. M. If I come home from swimming and I don't dry my hair, I'll get the cold. That always happens to me. I always have the cold.

These findings reveal that the "hot/cold" principle, which states that a heated human body should not be exposed suddenly to cold temperatures (George,1995), is one to which these students conform, and that the system of practices and beliefs through which this principle is operationalized in their daily lives is common to the group.

Thus far, the hot / cold principle has been applied to situations in which the mixing of the two temperatures has had a negative effect on the body. The students described other situations, however, in which the mixing of the hot and cold is beneficial. In these situations the heated body is exposed to material - foods or herbs, which are thought to possess an inherent "cooling" property. For example, one student explained the action of *aloe vera* on an upset stomach. She had described the upset feeling as "fireballs inside your stomach moving about" :

Y.P. But what happened, what I felt happened...as soon as I took the aloes, the aloes sort of....all the turmoil I felt inside the stomach....

S.H. The fireballs that you talked about?

Y.P. Yeah...that it liked cooled it down, and then it started to work. In my intestines and stuff.

Other students described some foods which are not digested easily as "heavy". Examples of these foods include rice, macaroni and steak. It seems that these heavy foods increase the heat of the body :

S.H. And how does the heavy food make you feel inside? Do you get a heavy feeling?

J.M. Not a heavy feeling. But kind of warm.

S.H. A warm feeling? What gave this warm feeling?

J.M. Well, when I visited my mother, we ate steak, and it was a kind of feeling of warm inside. It was a stuffed feeling.

From these accounts, it seems that the body can tolerate only a certain amount of "heat". If that is exceeded the balance is upset, then the body experiences a state of discomposure. At these times a "cooling food", such as *aloe vera* is used to counteract the heat. Vegetables and tomatoes were also described as cooling foods.

The excerpts illustrate that the students are guided by the hot/ cold principle in the choices that they make in their everyday lives, and that the constituent frameworks are employed in the explanations which they pose for the phenomenon that they encounter.

The accumulation of wastes in the human body.

The second system which emerged revolves around the belief that wastes accumulate in the human body. In aspects of general health, students thought that it was necessary to remove impurities from the body through the process of "cooling/ purging" in order to avoid sickness. Among the examples of "coolings" which the students volunteered were "cucumber water" and "burnt bread water". These "coolings" are made from the cucumber skin which is added to hot water. The liquid is allowed to cool, and is drunk. The burnt bread water

is made by burning the bread, and adding water. This liquid is also drunk. The burnt bread water is the cooling with which most students are familiar, but aloe was also recommended very highly by one student as a very effective cooling agent.

Some students believe that impurities are left back from the food that we have eaten. For example, too many staples can cause these impurities to form, and the impurities can cause the formation of gall stones in the kidney. The coolings help to flush out the impurities :

L.E. When you eat, you have certain left over things that stays there, it...somehow you can't get it out. And when you take cooling, it have certain different chemicals inside of the different bushes and things like that. It cleanses you. It goes down inside of you and just flushes it out.

S.H. Do you think that it's a worthwhile...?

L.E. It's needed, it's needed. Because when things start...it could cause damage inside of you, if there's too much impurities.

S.H. Left back?

L.E. Because there's also things like gall stones that could form in your kidneys because of different impurities and different things like that. So to flush out all of that, you know, it's best to take the thing. Too much staples can also cause different things to form inside of you.

S.H. What is cooling?

N.Q. Cooling is to cleanse the inside of the body or something.

S.H. Clean it from what?

N.Q. Well, like when you drink things like "Kool-Aid" or something like that. The dregs may cause a stone or something. That's why you have to drink plenty of liquids and cooling to wash it down.

J.M. I really did not know about "carrot water" at first. But when I saw "carrot water" on the questionnaire, I thought that it had to be some kind of cooling for the body. Something that purifies the body, takes out all of the wastes, excess wastes and all that. And good for purging too.

S.H. Why are there excess wastes in the body?

J.M. Well, sometimes, when you eat a lot of junk food, it's not healthy. And all kinds of fatty stuff get in your body. You need to purify your body, or inside will get clog up with a whole set of wastes. You can't have a lot of waste there, and you need to be healthy. Cause if there are too many impurities inside of you, you can die or get some disease in your body.

It is not clear if the students believe that the wastes are the excess foods, that is, food that the body does not need, or if wastes are produced as a result of the actions of the body. What is obvious is that they believe that wastes originate from certain foods. It seems too, that there is a link between the accumulation of wastes in the body, and the appearance of pimples on the face :

Y.P. Well, for my toxic level, he told me to stay away from pork, beef, sour cherries.

S.H. What happens when your toxic level rises? How do you feel?
Y.P. Well, it's....you don't feel anything,
S.H. You don't feel anything?
Y.P. It's just a matter of unconsciousness, you don't know anything. Only sometimes I get a lot of pimples.

Some students have stated that the appearance of pimples on the face is a manifestation of heat in the body. It seems that the body can become heated internally, and at times like this, a cooling is needed :

S.H. What is cooling?
S.G. Well, I take cooling when the body is heated and all of that. When heats come out.
S.H. What do you mean by heats?
S.G. Pimples.
S.H. What coolings do you take?
S.G. Carrot water and burnt bread water. I haven't taken that in some years.
S.H. What does cooling do?
S.G. It prevents you from getting heats and all of that, and it cools down the body.
S.H. How do you know that the body is heated?
S.G. My mom tells that the body is heated. But I never really asked her how you know that. But she just said that.
S.H. So you never had any feeling that it was heated?
S.G. No, you don't feel different or anything.

From these excerpts, it seems that there is a direct relationship between the accumulation of wastes in the body, the body description of the body as "heated", and the appearance of pimples on the face. This type of heat in the body seems different from the heat that results from sleeping, playing in the sun or exposure to other hot environments, for example, a stove or an electric iron. This type of heat is an internal heat and it is treated with "coolings".

In general, some students described two main functions of cooling : (i) to counteract an internal heat, and (ii) to cleanse the body. Most students gave the cleansing function of cooling only, and some of the students described separate functions of cooling and purging :

K.Y. When you take a cooling, you take a purge to clean out everything else.
S.H. And you say that you take a purge right after the cooling? What does that do?
K.Y. Also to flush out the cooling and everything one time.

J.M. With a purge, you go to the toilet often. When I get cleansing with herbs, I don't really go to the bathroom that often.

Others seemed unsure about the differences between cooling and purging :

K.M. Cooling is am.. something like a purge. When the unwanted wastes in the body... If you haven't been to the bathroom for a little while.

For a few students the differences surfaced during the interview :

S.H. You also wrote that cooling is to help you excrete. How do you think the cooling works?

A.C. Am...I think I mixed that up there you know. That's purge.

These findings reveal that the students believe that wastes can accumulate in the human body, and that these wastes are related in some way to the food that is eaten. The accumulation of the waste material in the body can result in illness or even death. It is important, therefore, that coolings and purges be included as a part of the regimen of health care.

Summary

Generally, the results of this exploration indicate that the students who attend an urban secondary school do enter the science classroom with beliefs and practices which are guided by (i) the "hot/ cold principle", and (ii) the "cooling / purging principle". A framework of practices and beliefs is organized around each principle.

The major tenet of the "hot/ cold principle" is that a hot human body should not be exposed suddenly to cold environments. Other contributing principles include that the body can become heated as a result of everyday activities. These activities include natural body processes, for example, sleeping, the types of food that is eaten, and processes which generally involve some type of heat transfer to the body from the sun or other heat source. Heat is often thought of as the intrinsic state of the human body or other materials. In the absence of this intrinsic property, the material is described as cold. The practices which are advocated are mainly preventative, and are meant to promote appropriate ways of interacting with the environment.

Persons who adhere to the "cooling/ purging principle" believe that wastes can accumulate in the body, and so the body must be cleansed through the use of "cooling". The wastes are usually the result of excess food. It seems that there is a link between the type of food that is eaten, the body being described as "heated", the appearance of pimples of the face and the back, and the use of "cooling". Further investigation is needed.

Discussion.

These findings show that the students in the urban school under study do have practices and beliefs in aspects of health and nutrition which are based on traditional wisdom. These results add to those of George (1995) who studied the traditional practices and beliefs of persons who reside in a rural village in Trinidad, and confirm the presence of this phenomenon in the lives of school children in Trinidad and Tobago.

In school science, there is no principle that one can contract a cold as a result of inappropriate ways of interacting with the environment. Instead, a

mediating virus is the external agent that is thought to be responsible for the cold. In traditional wisdom, this mediating agent is absent. If these differences are understood, then teachers are better able to understand how the students are thinking about the concepts that are being taught in the science class. They could then direct their efforts at stating explicitly the differences between the traditional principles, and the conventional science principles. When it has been established that there are two different explanations for the same phenomenon, then the students may be encouraged to approach the school science concepts with a new attitude which may increase their chances of understanding the science that is presented in class. In a similar fashion, the students' concepts of "cooling", for which there is no parallel in conventional science could be used as starting material for discussions on the digestive, and circulatory systems.

The similarities which are found within practices can be used as the springboard for teaching the concept and should enhance motivation as the students see the relevance of what they are doing in the science class to their actions outside of school.

The implementation of science curricula through the use of students' traditional practices and beliefs in aspects of health and nutrition will allow for a holistic approach to science teaching/learning, and will provide the link between the concepts that are presented in the formal science classes and the everyday lives of the students.

Students always try to explain the phenomena that they encounter. They also seek verification of the explanations that they have. One student described her personal search for some clarification on the concept of "cooling" in this way : "I have never heard about cooling or read it in a book." The approach that is suggested in this paper could provide the opportunity for students to discuss the practices and beliefs which are common to the group and should also facilitate the students' access to conventional science concepts.

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Biography

Susan Herbert is a Temporary Lecturer in Science Education at the School of Education, UWI, St. Augustine, Trinidad. She has taught General Science and Chemistry at the secondary school level (ages 11-19 years) for fifteen years.