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The Boundaries Between Caribbean Beliefs and Practices and Conventional Science

June George and Joyce Glasgow

EFA IN THE CARIBBEAN: ASSESSMENT 2000
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THE BOUNDARIES BETWEEN CARIBBEAN BELIEFS AND PRACTICES AND CONVENTIONAL SCIENCE

IMPLICATIONS FOR SCIENCE EDUCATION IN THE CARIBBEAN

June George and Joyce Glasgow

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FOREWORD

Education for All in the Caribbean: Assessment 2000 is a remarkable output, which is the culmination of intensive collaborative efforts between the countries of the Caribbean sub-region, the Regional Advisory Technical Group and the EFA Forum Secretariat, and relevant agencies and institutions.

The Country Reports, Monograph Series, and Case Studies highlight and pinpoint, in an extremely effective manner, some of the issues and concerns that drive education policy and action in the Caribbean. At the same time, the documentation presents a balanced and informed overview of the rich and varied educational and cultural experience of the sub-region; a knowledge which is critical to the understanding of the unfolding social and economic developments.

UNESCO is pleased to have been associated with this endeavour, particularly through our regional office in Kingston, Jamaica which, as co-ordinator of the Regional Advisory Group for the Caribbean Sub-region, was integrally involved in every aspect of the exercise. We look forward to continued collaboration with the Caribbean on activities of a mutually rewarding nature as the consequences and implications of the EFA Assessment become manifest.

Colin Power
Deputy Director-General for Education
UNESCO

SERIES INTRODUCTION

At Jomtien in 1990, member states of the United Nations adopted the *Framework for Action to Meet Basic Learning Needs* and created the International Consultative Forum on Education for All (EFA Forum). One decade later, the EFA Forum embarked on an assessment of this initiative, intended to assist member states in examining their education provisions to inform the formulation of policy.

Once the Caribbean EFA Regional Advisory Group had embarked seriously on the assessment, it was quickly realised that it would be difficult to capture, in any one place, an assessment of all that had transpired in education in the Caribbean during the period 1990-1999. Moreover, the technical guidelines constrained assessors to specifics within quantitative and qualitative frames. However, because it was felt that education in the Caribbean is too dynamic to be circumscribed, the idea of a more wide-ranging monograph series was conceived.

Researchers, education practitioners, and other stakeholders in education were invited to contribute to the series. Our expectations were that the response would be quite moderate, given the short time-frame within which we had to work. Instead, we were overwhelmed by the response, both in terms of the number of enthusiastic contributors and the range of topics represented.

Caribbean governments and peoples have invested in the *hardware* for education-buildings, furniture, equipment; in the *software,* in terms of parent support and counselling services; and they have attended to *inputs* like books and other teaching/learning resources. They have wrestled with ways to evaluate, having gone through rounds of different national examinations, and modifications of ways to assess both primary and secondary education.

But, as the efforts to complete the country reports show, it has been more difficult to assess the impacts, if we take the eventual aim of education as improving the quality of life--we have had mixed successes. That the sub-region has maintained relative peace despite its violent past and contemporary upheavals may be cited as a measure of success; that the environment is threatened in several ways may be one of the indicators of how chequered the success has been.

Writers in the monograph/case study series have been able to document, in descriptive and analytic modes, some of the attempts, and to capture several of the impacts. That this series of monographs on Education for All in the Caribbean has been written, edited, and published in nine months (from first call for papers to issue of the published titles) is itself an indication of the impact of education, in terms of human capability and capacity.

It reflects, too, the interest in education of a number of stakeholders without whom the series would not have been possible. Firstly, the work of the writers is acknowledged. All worked willingly, hard, well, and, in most cases, without material reward. The sterling contribution of the editor, who identified writers and stayed with them to the end of the process, is also recognised, as is the work of the printer, who came through on time despite the severe time constraints. The financial contribution of the following agencies also made the EFA assessment process and the publication of the monograph/case study series possible: Caribbean Development Bank (CDB), Commonwealth of Learning (COL), Department for International Development (DFID), International Labour Organization (ILO), Sub-Regional Headquarters for the Caribbean of the United Nations Economic Commission for Latin America and the Caribbean (UNECLAC), United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Population Fund (UNFPA), the United Nations Children's Fund (UNICEF), The University of the West Indies, Cave Hill, the World Bank, and the UN country teams based in Barbados, Guyana, Haiti, Jamaica, and Trinidad and Tobago.

We invite you to peruse individual titles or the entire series as, together, we assess Caribbean progress in education to date, and determine strategies to correct imbalances and sustain positive impacts, as we move towards and through the first decade of the new millennium.

Claudia Harvey
UNESCO Representative and Coordinator, Regional Technical Advisory Group (RTAG)
EFA in the Caribbean: Assessment 2000

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The authors would like to thank those who helped to facilitate the research on which this monograph is based:

- the citizens and institutions in Jamaica and in Trinidad and Tobago that were the source of the information on the beliefs and practices;

- the students of both territories who completed questionnaires, thus providing the authors with a measure of their commitment to local beliefs and practices;

- the citizens of the village of "Seablast" who shared their ideas and explained the beliefs and practices which guide their lives.

About the Authors

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Joyce Glasgow was formerly Senior Lecturer in the Faculty of Education at The University of the West Indies (UWI), Mona, Jamaica. An educator with more than 30 years of experience at the tertiary and secondary levels, her main interests are in the fields of environmental education, science education, biology, scientific literacy and traditional beliefs, in which areas she has had several publications. In retirement, she continues to be actively associated with post-graduate work in science education at The University of the West Indies at Mona, with secondary school biology at the review level, and with environmental education.

ABSTRACT

This monograph presents a summary and analysis of the research in the Caribbean on cultural practices and beliefs and their possible impact/influence on science education, especially in schools. Interest in the above as an area of research in the region, emerged almost simultaneously in two different but linked areas of concern. On the one hand, a willingness or not to accept as truth (against logical evidence to the contrary) selected local beliefs, was used as one of several measures of scientific literacy in lower secondary students in the Jamaican context (Glasgow, 1981). George (1986), on the other hand, dealt with science-related social beliefs, and the response of lower secondary students to some of these in Trinidad and Tobago. Both these initial pieces of research suggested that there was a high degree of commitment to local beliefs amongst the students of both territories, and prompted the undertaking of more detailed cross-territory work. This resulted in the abstraction of certain distinctive principles which seemed to characterize these beliefs/sayings (George & Glasgow, 1988). This earlier work is discussed in Section 1. At this juncture, the importance of exploring the interpretive framework or worldview which underpins these characteristics was recognised. Consequently, the first attempt to unearth the logical structure and content/philosophy of the worldview of a society which uses these beliefs/sayings, and to compare the findings with those from other cultures was undertaken (George, 1995a). The worldview analysis comprises Section 2 of the work.

Throughout all the research, one central concern has been the practical use to which the knowledge gained might be put to enhance science education in schools. In Section 3, some of the implications of the research findings and recommendations are presented as they apply to the students, the teachers, and the school curriculum. Finally some recommendations for future research are suggested. These include: (a) study, documentation, and categorisation of the beliefs/sayings on an on-going basis; (b) analysis of the similarities/differences/congruence between the traditional and scientific understandings/explanations/world view as it pertains to the various content areas of the beliefs/sayings; (c) design of pedagogical strategies to allow students to understand and, therefore, be able to make choices between the two worldviews, which are both "blueprints" for life; (d) examination of possible teacher education procedures to facilitate the implementation of such pedagogical strategies; and (e) extrapolation of the findings in science-related sayings to research in other disciplines with the aim of obtaining a more holistic societal picture.

SECTION 1

History and Evolution of the Research

Introduction

In the preface to his book, *Science for the people,* Layton (1973) states: "Rather more than a decade of curriculum development supported by human and material resources on an unprecedented scale, has not removed the impression that science is still failing to achieve its full potential as a branch of education in schools" (p.7). Layton was writing in the English context, but most of those involved in the educational enterprise worldwide today would agree that this statement is still true, a quarter of a century later. Certainly science educators in the English- speaking Caribbean would agree.

The nations of the English-speaking Caribbean have common features in their historical and cultural background. A general pattern of over 300 years of political dominance by European powers, especially the British, is evident. There is a legacy of African slavery in all the territories and the system of East Indian indentureship in a few. In addition, other peoples, for example, the Chinese, Jews, Lebanese, French, and Spanish have contributed to the interesting and varied cultural backgrounds in these territories, and to their rich store of traditional knowledge. Traditional knowledge is here linked to cultural background, and refers to the knowledge that exists in a setting as a result of the norms, values, practices, and beliefs in that setting. Such knowledge is usually passed on orally from one generation to the next.

Many Caribbean nations gained political independence in the 1960s. Jamaica and Trinidad and Tobago, where the data used in this monograph originated, both became independent in 1962. With independence has come an increasing and open willingness to recognise, explore, and benefit from the cultural mix. Perhaps because of the immense complexity of the issues involved, and because research in these territories has tended to follow the lead of the metropolitan countries, research on traditional knowledge as it pertains to education in general, and to science education in particular, is only now gaining the prominence it deserves.

Not surprisingly, formal education patterns in the Caribbean had largely followed the British mode, and curricula in the schools have been shaped by the external General Certificate of Education (GCE) examinations of Cambridge and London Universities at Ordinary and Advanced levels. The excitement and ferment of political independence, among other things, spawned the formation in the late 1970s of a regional examining body, the Caribbean Examinations Council (CXC), to cater more nearly to the needs of Caribbean children.

The flurry of science curriculum innovations worldwide, especially in the 1970s, all seeking to help science in schools attain its "full potential," has had its "spin offs" in Caribbean school science. What Caribbean educators did not take into account before embracing some of these innovations were their manifest effects, success, or otherwise, in the countries of origin. More importantly, they failed to take into account the differences in cultural context between these countries and the Caribbean. As George and Glasgow (1989) argue, common syllabi and common examinations make one of two covert assumptions--either that the cultural background of students does not significantly affect learning, or that this background is similar in those for whom these syllabi and examinations are intended.

The first assumption is not likely to be a valid base for the use of common syllabi, since research has shown that some interference between cultural background and school learning does occur (Champagne,1986; Cobern, 1994; Hewson &

Hamlyn, 1984; Jegede, 1995; Okebukola, 1986; Prout, 1985; Thijs, 1987). In a critical look at science-related beliefs Caribbean children would take into school, George and Glasgow (1989) concluded that the cultural background experiences and knowledge of these children are similar enough to support the use of common CXC syllabi in science (p.121).

This question of the kinds of background knowledge children bring with them to their science classes has been engaging the detailed attention of science education researchers worldwide over the past two decades or so. Initially, the focus was on children's understanding of specific concepts in science, as evidenced in the work of research groups such as the Children's Learning in Science Group at the University of Leeds, United Kingdom, and the Learning in Science Group at the University of Waikato, New Zealand. The impact of students' prior knowledge on student interpretation of concepts, and the fixity of such knowledge in the face of attempted conceptual change, helped to strengthen the constructivist model of learning. Seminal works such as those of Driver and Erickson (1983) and Gilbert, Watts, and Osborne (1982) attest to this.

As Jegede (1995) points out, however, prior knowledge and the socio-cultural environment of the learner "are inseparable, with the latter creating and nurturing the former" (p. 100). Early work by Solomon (1987) and others was instrumental in incorporating the social element into the model of conceptual change. As Fensham (1999) suggests, however, what should be offered, if it is hoped that children from non-Western cultures learn a subject matter as grounded in Western culture as science is, is not conceptual change, but conceptual addition. One might also add conceptual modification. The important outcome should be that two sets of knowledge, rather than one, become available to students for use in the different contexts in which they find themselves.

Two sets of knowledge refer, of course, to knowledge of conventional science, and the conceptions children hold prior to formal instruction. There is some research evidence which indicates that these latter conceptions may, in part, be the result of the traditional practices and beliefs that exist in their communities, and to which students are committed (Hewson & Hamlyn, 1984; Jegede & Okebukola, 1987; Rice & Gunstone, 1986).

Preliminary Research Work in the Caribbean

Interest in this area of research emerged almost simultaneously in the Caribbean, in two different but linked areas of concern. Glasgow (1981) used, as one of a group of measures of scientific literacy in lower secondary students in Jamaica, their level of willingness to accept selected local beliefs as truth against logical evidence to the contrary. She selected 20 common beliefs from a pool of beliefs provided by individuals representing a wide cross-section of Jamaican society. A deliberate attempt was made to include items which would be within the experience of both rural and urban children (for example, *"A pregnant woman should not hang clothes on a line or the cord will wrap around the baby's neck"*; and *"If you fill your stomach and plant peas, it will bear well"*). These items comprised a Beliefs scale.

Students were asked to define each item on the scale as being either true or untrue. A score of "0" was given for each item listed as true and a score of "1" for each designated untrue. Therefore, the maximum score on the scale was 20. The assumption was that designating the saying as untrue was evidence of a student's unwillingness to accept the statement without question.

Of the 643 students in the sample, only 14 (2%) classed all the sayings as being untrue. Some 70% of the sample had scores below 16, and nearly one-half of this group had scores of 10 or lower. Glasgow interpreted these scores as suggesting that despite exposure to three years of an integrated science programme, students were highly committed to these beliefs.

George (1986), on the other hand, focused on analysing the everyday, local knowledge existing in communities in Trinidad and Tobago, which she termed "street science." She defined the term to refer to "those social customs and beliefs that deal with the same content areas that are dealt with in conventional science but which sometimes offer different explanations to those offered in conventional science" (p.1). For example, conventional science would trace the cause of a common cold to a virus. In street science, the common cold is thought to be caused by exposure to temperature changes such as having a cold shower immediately after vigorous exercise. George did not include in her classification of street science, beliefs that embody content areas that fall outside of the domain of conventional science. For example, the concept of luck as in "opening an umbrella in a house will bring you bad luck" is not dealt with in conventional science. Such beliefs were, therefore, not classified as street science in this work.

The results of George's (1986) study indicated that street science abounds in the local community, and that a large percentage of street science concepts is not supported by conventional scientific principles. As a result of this preliminary investigation, George proposed a general scheme for categorising such traditional knowledge when consideration is being given to using it in the science classroom. She suggested that, at the level of content, the relationship between this type of knowledge and conventional science may be described using four categories:

Category 1. **The traditional knowledge can be explained in conventional science terms.** For example, the practice of using a mixture of lime juice and salt to remove rust stains from clothes can be explained in conventional science in terms of acid/oxide reactions.

Category 2. **A conventional science explanation for the traditional knowledge seems likely, but is not yet available.** For example, a brew made from the plant "vervine" *(Stachytarpheta)* is used in the treatment of worms in children. This plant is considered in conventional science circles to have pharmacological properties, but appropriate usage has not been verified.

Category 3. **A conventional science link can be established with the traditional knowledge, but the underlying principles are different.** For example, the admonition that eating sweet foods causes diabetes links diabetes with sugars, as does conventional science. However, whereas the traditional knowledge would state that sugars cause diabetes, conventional science claims that when one is diabetic, the ingestion of sugars can cause one's condition to worsen.

Category 4. **The traditional knowledge cannot be explained in conventional science terms.** For example, there is no conventional science explanation for the claim that if one cuts one's hair when the moon is full, the hair will grow back to an increased length.

In this study, George also found that lower ability students in Senior Secondary schools in Trinidad and Tobago were heavily committed to street science, whether or not they had been exposed to the CXC Integrated Science Basic Proficiency syllabus. This science syllabus is intended to provide a knowledge of science for "daily living" to those Caribbean secondary school students who would not typically continue to study science beyond the first five years of secondary school. An analysis of this syllabus revealed that it contains some content areas where students are likely to experience conflict with their previously held street science concepts and principles. For example, the syllabus contains units dealing with food and nutrition, and human reproduction; these are areas in which traditional beliefs abound. However, there is no mention of elements of street science in the syllabus.

This research work also indicated that, not only are the concepts in street science sometimes different from those in conventional science, but that the nature and function of the two modes of thought are in some ways different. In particular, George noted the difference in the consideration of evidence. In conventional science, beliefs are thought of as tentative, subject to the emergence of fresh evidence that might contradict. Beliefs in street science, however, are held as conclusive truths because of the force of tradition behind them, and there is less emphasis on acquiring empirical evidence to support claims.

These initial pieces of research suggested that there was a high degree of commitment to local beliefs and practices in both territories, and that these beliefs and practices were not always in accord with conventional science. These findings prompted the undertaking of more detailed cross-territory work. Both authors recognised the necessity to gain a deeper knowledge about, and some understanding of, the meanings of the beliefs themselves, if any probable specific implications of these beliefs for the classroom were to be identified.

Accordingly, a sample of 236 of these beliefs/sayings was collected from a variety of sources in both territories, including elderly citizens, practising small farmers, teachers, school children and their parents, science educators, medical personnel, university staff researching bush medicines, and regional creole and oral traditions. The initial research by the authors tended to be mainly descriptive. In this new, joint effort, however, the sample was used as the basis for what, in fact, represents the first attempt in the Caribbean to delineate some of the characteristics of these sayings. Specifically, this stage of the work sought to look for any patterns which might help to elucidate their meaning further (George & Glasgow,1988).

Three "layers" of patterns were recognised:

- **Content patterns:** Content areas covered by the raw data included nutrition, health, reproduction and child care, lunar effects, food production, and temperature changes. Not surprisingly, the areas of nutrition and health (34%), and reproduction and child care (29%) were the focus of the majority of the sayings. These dicta, after all, represent the survival code of a people.

  Consonance/dissonance with concepts and principles of conventional science: Using George's (1986) categorisation outlined earlier, the data revealed the same four levels of agreement postulated--from complete consonance with the concepts and principles of conventional science (Category 1 statements) to complete dissonance (Category 4 statements). Such a gradation of relationships between these two modes of looking at life experiences and natural phenomena must have implications for the teaching and learning of school science. The possibilities will be discussed in Section 3 of the work.

  Underlying themes: Attempts were made to abstract some of the inherent themes running throughout the body of beliefs and across content areas. Four main themes were identified:

  - *Cause and effect.* The whole system of cause and effect is simple, immediate, and direct. There is no intervention of physical or physiological processes between the two. For example, *"If a pregnant woman eats plenty of ochroes, she will have her baby easily."* Cooked ochroes are slippery, therefore eating much of this food will make delivery easier for the expectant mother.

- *Transfer of experiences and ideas/explanations across contexts.* The admonitions concerning temperature changes and colds exemplify the readiness to transfer experiences across contexts. One is advised, for example, to "cool off " before bathing, if one has been working in the sun, cooking, or ironing. Implicit in these statements is the idea that the core temperature of the human body can be changed appreciably by an external source of heat. The admonition to "cool off" before exposure to a cooler temperature also suggests that it is the difference between body temperature and the ambient temperature that can be harmful. The transmission of yield and phenotypic effects to plant life as a result of the human physical and emotional state is exemplified by such beliefs as *"Planting yams when one is hungry makes the tubers hollow."* Presumably, a hungry man is regarded as being "hollow" inside. Similarly, the "heat" of anger is probably thought of as being transferred to the fruit as is reflected in the saying that: *"If you plant peppers when you are angry, they will be very hot"* (to the taste).

- *Generalisations.* There is a tendency for generalisations to be made on the basis of limited evidence. For example, street science holds that "If there is a spell of very hot days, an earthquake is likely to occur." Minor earth tremors are a common occurrence in the West Indies, but major earthquakes are not common. Therefore, the evidence on which the statement was postulated is likely to have been very limited.

- *The ascription of special powers/characteristics to particular conditions/objects.* The foci for this characteristic in the beliefs examined are the moon and the female human being. The moon is portrayed as affecting several biological processes. It is thought, for example, to influence plant growth and productivity, the growth of hair follicles, and the time at which babies are born. Femaleness is regarded in a dual light. On the one hand, it is described as being almost akin to a curse, especially in its association with menstruation. The menstruating female is advised, for example, not to bake cakes, since they will not "rise." On the other hand, pregnancy is regarded as the harbinger of "plenty," so that, should a pregnant woman plant a pumpkin vine, or walk over one, it will "bear well."

Discussion

Preliminary research work in this area in the Caribbean revealed that, like their counterparts in other parts of the world, students in Jamaica and Trinidad and Tobago are committed to some of the traditional practices and beliefs that exist in their home communities. Many of these practices and beliefs deal with phenomena that are studied in school science.

The characteristics of the traditional mode point to a system which advances a *different* set of values to those of conventional science. Immediacy and directness in the cause/effect system omit the concept of variables and their separate and interactive effects, which is central to conventional science. Similarly, the importance conventional science accords keen observation and the repetitiveness of empirical evidence is missing in a system which affords ready generalisations. The transfer of ideas across contexts as described here, and the ascription of special powers to certain conditions/objects represent explanations which have no parallel in conventional science. Further, this system of beliefs is passed on from elders to the young in a family and community setting. This tends to foster a culture of acceptance, based on authority, rather than one of questioning which is one of the tenets of conventional science.

With the preliminary findings outlined above, it became obvious that for a clearer understanding of these beliefs and practices which would not only present new knowledge, but further inform efforts to deal with school science, it would be necessary to seek to find out the interpretive framework or worldview which underpins these beliefs. It was this realisation that led to the work of George (1995a) in exploring this framework. Section 2 deals with this second phase of the research.

SECTION 2

Worldview Analysis of Traditional Beliefs and Practices

The Context of the Study

Much has been written about the need to consider the cultural context of the learner in planning for teaching in science (Cobern, 1996; George, 1995a; George & Glasgow, 1988; Ogawa, 1986; Pomeroy, 1992). In spite of this acute awareness that the cultural background of the learner may be impacting significantly on students' ability to make sense of conventional science as presented in school, there is still much to be understood about how the interaction between students' traditional knowledge and school science occurs, and how the teaching/learning situation should be structured to cater for this interaction. Furthermore, the nature of the cultural background of the learner and the status that it should be accorded are issues under debate.

The traditional knowledge existing in a particular setting can be equated with the understandings of the world held by lay people in that setting. Several research paradigms have been used in the attempt to analyse these understandings. In his review of these paradigms, Furnham (1992) has identified four common themes (which are not necessarily mutually exclusive) that underlie research in this area. The first theme is a focus on how little lay people know and how wrong they are. The second theme is the attempt to find the cause(s) of this state of affairs, for example, texts, the media. The third theme focuses on the macro-system and seeks to identify the consequences of lay "ignorance" on economic growth and development. Finally, the fourth and most recent theme sees the lay person as a "skeptic and pragmatist" rather than as an "ignoramus or philistine" (p. 42).

This fourth theme is the one pursued in this monograph. It is the most reasonable of the approaches presented, and forms the backdrop against which attempts were made to understand the interpretive framework or worldview that underpins traditional background knowledge of learners in a rural setting in Trinidad.

This study on worldview (George, 1995a) was conducted in a coastal, rural village in North Eastern Trinidad. Villagers are engaged primarily in fishing and agriculture as their main occupations. Most of the people in this village are of African descent, although, as explained earlier, such people would also have experienced remnants of the influence of colonial powers in the past. In this village, there are three primary schools and one secondary school. Most of the children attend school in the village although a few travel out to schools in a nearby town. This, then, is a village that is fairly homogeneous, with a traditional knowledge base that is familiar to everyone, both young and old.

Data Collection and Analysis

Data on the lifestyle of villagers were collected through long engagement in the field and by way of interviews. The strategy of interviewing as wide a cross-section of villagers as possible was used. Thus, interviews were conducted with elderly villagers, young housewives, farmers, fishermen, public servants, teachers, secondary school students, and the unemployed. In a typical interview at the beginning of the project, one or two questions were first asked to initiate discussion on how the informant conducted his or her life in a particular area (e.g., health, household practices, and so on). Thereafter, the direction taken by the interview depended on what the informants had to say about the traditional background knowledge that they used in their daily living. Later in the project, the interviews were more structured as attempts were made to clarify meanings and concepts. All interviews were tape-recorded and later transcribed. Data were generated on several areas of villagers' lives. The analysis presented below refers to two aspects of villagers' lives only--health practices and marine-related activities.

Data analysis was begun during fieldwork. Broad open coding (Glaser & Strauss, 1967; Strauss & Corbin, 1990) was first done on the transcripts. Any potentially interesting concepts that began to emerge at this stage were followed up in further interviews. Further coding was done in which the initial codes used were combined into categories and, eventually, themes were generated. Finally, the substantive theory embedded in the data (Glaser, 1978) was articulated through propositional statements.

The following are the substantive theories with respect to two aspects of villagers' lives-- health practices and marine-related activities. Each substantive theory is set out in terms of the general interpretive framework that villagers use to guide their lives generally, and also in terms of the specific concepts/ principles that pertain to the particular area of human life being considered.

Substantive Theory With Respect to Health

General interpretive framework

Proposition 1: Villagers believe that nature provides all the elements for maintaining good health.
Proposition 2: Villagers believe that the rural setting is more conducive to healthy living than the urban setting.
Proposition 3: Villagers believe that food plays a pivotal role in the functioning of the human body.
Proposition 4: Villagers believe that individuals have a responsibility to take care of themselves.
Proposition 5: Villagers believe that individuals have different tolerance levels and, consequently, each individual must know his/her limits.
Proposition 6: Villagers believe that "heat" is generated in almost every activity in which an individual, living and working in a rural setting, is involved. This "heat" is most

often thought of as an intrinsic state of the body but is sometimes thought of as the thermal state.

Proposition 7: Villagers believe that "heat" is generated by physical activity; by exposure to energy sources; when sleeping; when the body is covered up; by eating certain foods; during menstruation; during pregnancy and in the *post partum* state.

Proposition 8: Villagers believe that a healthy body is in hot/cold equilibrium. Extremes of either kind are to be avoided. If the equilibrium is upset, sickness would result.

Principles related to the functioning of the human body

Villagers described ways of conducting their lives which suggested that they believed that nature has a profound impact on the functioning of the human body. They, therefore see it fit to cooperate with nature, control nature, or exploit nature as the situation dictates.

Cooperating with nature

Proposition 9: Villagers acknowledge that there are certain aspects of nature that influence the functioning of their bodies and over which they have no control. The main influences identified were the moon and the physiological states of menstruation, pregnancy, and childbirth.

Proposition 10: Villagers cooperate with those aspects of nature that influence the functioning of the human body and over which they have no control:

(1) Villagers link the menstrual cycle and the incidence of childbirth with phases of the moon.
(2) Villagers imply that the female body is in a "heated" state during menstruation, pregnancy, and childbirth. Villagers employ the appropriate precautionary aspects of the hot/cold equilibrium

principle during menstruation, pregnancy, and childbirth. Specifically, they advocate not bathing during menstruation and in the *post partum* state (to prevent colds); bathing often during pregnancy (to remove "heat"); and abstaining from acidic foods during menstruation and after childbirth (to prevent curtailment of the flow of blood).

(3) Villagers accept that the pregnant woman has a direct effect on the unborn foetus. They therefore advocate that pregnant women exercise caution in their interaction with the environment and with their choice of foods, lest they harm the foetus.

Controlling nature

Proposition 11: Villagers acknowledge that there are certain aspects of nature that have the potential to act negatively on the functioning of the human body but which could be controlled. The aspects identified were the physical environment, food, the temperature of the surroundings, and water.

Proposition 12: Villagers attempt to control those aspects of nature that have the potential to impact negatively on the functioning of the human body:

(1) Villagers control the physical environment by exercising care when interacting with it and/or by attempting to acclimatise themselves to it.

(2) Villagers employ a variant of the hot/cold equilibrium principle, which states that hot and cold do not "mix", with respect to interaction with water and exposure to cooler temperatures.

(3) Villagers attempt to control the quantity of "heat-containing" foods eaten and/or employ a regimen of "cooling" and purging to control the amount of "heat" in the body.

Exploiting nature

Proposition 13: Villagers acknowledge that there are certain aspects of nature that can be exploited for maximum health benefits. These are the sea and sea breeze, fresh meat and garden produce, and herbs.
Proposition 14: Villagers exploit those aspects of nature that contribute to the proper functioning of their bodies:

(1) Villagers make maximum use of readily available herbs as medicines in both curative and preventive ways.
(2) Villagers make maximum use of fresh meat and garden produce in their diets.
(3) Villagers value the sea and sea breeze as contributors to healthy living.

Substantive Theory With Respect to the Marine Environment

From the descriptions which villagers gave of how they interact with the sea through fishing and other activities, and how they make use of the marine environment generally, the propositions detailed below were deduced.

General interpretive framework

Proposition 1. Villagers believe that knowledge is best acquired through activity in the context in which the activity is normally performed. Thus, for example, one learns about fishing through the activity of fishing.
Proposition 2. Villagers believe that one must first acquire specific knowledge pertinent to a particular situation in order to begin to function in that situation.
Proposition 3. Villagers believe that in order to become an expert in an activity, one must first have exposure to the

conduct of that activity by a proficient practitioner. For example, one can become an expert in fishing by watching a proficient fisherman practise his craft.
Proposition 4. Villagers believe that one must learn how to co-operate with nature if one is to survive.
Proposition 5. Villagers believe that the marine environment is a total environment, providing for recreation, sustenance and physical well-being.

Conceptions of the marine environment

Proposition 6. Villagers believe that sea food is highly nutritious.
Proposition 7. Villagers believe that the sea is a natural resource to be exploited for food.
Proposition 8. Villagers believe that one must possess certain knowledge and skills relevant to the marine environment if one is to function successfully and safely at sea.

(1) Villagers believe that the movements of the moon/ tide impact on the behaviour of fish.
(2) Villagers believe that in the act of fishing, there are several form/function relationships that must be observed.
(3) Villagers acknowledge that one must exercise extreme caution when interacting with the sea because the sea is potentially dangerous.

Proposition 9. Villagers believe that sea water and the action of the waves serve to maintain health and to cure certain illnesses.

Discussion

The analysis in Section 1 pointed to several similarities and overlaps in the principles relating to conventional science and to the traditional beliefs and practices under study. In addition, it indicated several basic differences in approach to the interpretation of data and to the dissemination of nature-based knowledge. The deeper look at the worldview underpinning these principles in the traditional mode, which is outlined above, supports this combination of similarities with important differences in the tenets and pre-suppositions which characterise the approach to nature in the two systems.

The attitude toward nature detected in the village described above, revealed an underlying assumption that nature must be treated with respect and regarded with awe. Nature provides everything that is needed for survival, and one should manage one's interaction with nature to reap optimum benefits. This may require different strategies according to need--exercising control over those aspects which may be controlled, co-operating with nature, or simply making the best use of the good that nature offers. There were no overt references to maintaining the quality of the environment. Rather, the emphasis was on recognising the power of nature and learning how to manage one's interaction with it, since the relationship is mutualistic, and recognised as such at a very personal level. Each individual, as long as he/she is old enough, is expected to interact with nature in appropriate ways.

Conventional science also promotes effective interaction with nature, but often the emphasis is on gaining understanding so as to make possible manipulation and exploitation, an orientation fuelled by technological advances. Deep respect is perhaps only now becoming, as a general rule, an integral part of the scientific enterprise, as mankind seeks to stop (where possible), slow down, or repair some of the exploitative damage that has been done over time. Even in these situations, the responsibility often tends to be communal rather than deep personal commitment.

The way in which villagers understand reality differs somewhat from conventional science. The positivist, empiricist orientation, with its emphasis on the impartiality of observations and the sufficiency of evidence, that still characterises some of conventional science and much of school science, was not predominant in the worldview of the villagers. Many aspects of traditional knowledge are accepted on faith, the general philosophy being that what has been tested and proven by the elders over time is of worth. Certain applications of the hot/cold theory which influences so much of villagers' practices, as well as the use of herbs as medicinal agents, fall into this category. In such instances, issues of sufficiency of evidence, objectivity, and impartiality on the part of the observer do not arise. This finding supports the trend to easy generalisations revealed in the patterns abstracted in the earlier research (see Section 1).

However, not all of the traditional knowledge was treated in this way. Villagers were sometimes willing to modify their traditional approach if, in their experience, it did not "work." In other words, pragmatic considerations sometimes took precedence over the traditional wisdom, especially among those, like high school students, who had had some exposure to conventional science. Even in these cases, however, rejection of the traditional wisdom was at a very personal level. "That never happen to me yet," and "I know somebody who…" were common refrains.

This projection of self, or of someone with whom one is intimately connected, as the basis on which decisions are made, reiterates the importance accorded to "the self," already mentioned above with regard to one's interactions with nature. Supporting this tenet further is a constant reference to the uniqueness of the individual, as well as the general philosophy that one must accept the responsibility of taking care of oneself, as soon as one is old enough. This accent on "the self" is evident in the current thrust in preventive medicine to promoting and maintaining "wellness." In general, however, it may be said that the deep respect accorded impartiality and objectivity in conventional science is a denial of self--this despite the fact that science will agree with Polanyi that the observations on which scientific knowledge is based all carry some subjective element.

The concept of "heat" in the traditional wisdom may be considered an abstract concept, of the same order as postulated entities in conventional science. No one claims to have seen heat, although it is thought to exist because of certain physical manifestations. The concept is, therefore, a creation of the mind which serves to help make sense of the world. Concepts in conventional science serve a similar purpose.

The hot/cold theory and the related equilibrium principle pervade the traditional system. They serve as a link, unifying various aspects of villagers' lives. They serve as a tool to facilitate prediction of what would happen to the human body under particular conditions. They are also used in a *post hoc* manner to make sense of situations after the event. In short, they provide a sense of order and allow villagers to analyse their state within their total environment. Theories and principles function in a similar manner in conventional science.

It was Francis Bacon who asserted *"Scientia est potentia."* This sentiment was particularly strong among the fishermen, although not confined to this aspect of village life. Knowledge is power. A fisherman cannot function effectively at sea without the requisite knowledge.The importance accorded the knowledge base fits well with conventional science. The difference between the two systems in this regard is that whereas the knowledge base of conventional science is expanding at an exponential rate, that of the traditional mode, if it does expand at all, does so in very small increments. Rather, some re-working of the traditional is occurring in those instances where there has been some exposure to, and acceptance of, aspects of conventional science. The process may be described as a personal construction of knowledge, which draws on the traditional knowledge which has been socially constructed over the years, and on conventional science. There is evidence from other settings that this process is fairly common among lay people (Layton, D., Jenkins, E., Macgill, S., & Davey, A., 1993; Wynne, 1991).

It is clear that the traditional practices and beliefs that exist in this community constitute an intricate knowledge system, supported by a worldview that is in some ways similar to, and in many ways different from, the tenets of conventional science. This has implications for the ways in which children from such backgrounds should be taught conventional science in schools. Section 3 explores this challenge.

SECTION 3

Looking to the Future

Section 1 of this monograph sought to deal with the documentation of the beliefs and practices under study, and to capture the general patterns of (or related to) their qualities and characteristics which seemed to emerge from an initial content classification. Prompted by this broader knowledge, the second phase of the research outlined in Section 2 explored the worldview which underpins the principles/characteristics which had earlier emerged. In this section, the implications of the research findings for science education in the Caribbean will be examined, and some suggestions put forward for steps which might be taken to use the findings to make science more accessible to the school population. Ideas for future research will also be advanced. Although the data used in the analysis were collected in Jamaica and Trinidad and Tobago, the historical and cultural similarities of the Anglophone Caribbean allow for the extrapolation of the findings across the region.

Implications of the Research Findings for Science Education in the Caribbean

If one accepts the constructivist model of learning, then the findings outlined in Sections 1 and 2 of this monograph have important implications for the teaching/learning of science. As the old adage puts it, teachers have to begin from where their learners "are," if these learners are to reach a desired point. In this instance, "where they are" refers specifically to the prior conceptions children hold before formal instruction, conceptions which partly arise out of the beliefs and practices which govern their everyday lives. For convenience, these implications are discussed below as they might apply to students, their teachers, and to science curricula.

Implications and recommendations for students/learners

(1) Issues relating to the acquisition and retention of conventional science

Perhaps the basic and most important issue here is the question of how students' conceptions prior to formal instruction may affect acquisition and retention of conventional science as presented in school science classes. These prior conceptions of students are likely to have firm experiential foundations in traditional knowledge and, because of this, to be very stable (Driver & Erickson, 1983). If it is also accepted that such conceptions can involve *different categories* of such knowledge, as outlined in Section 1, then one also has to accept that the interaction between school science and students' prior knowledge is likely to be multifaceted.

It will be remembered that the following categories were recognised in the traditional knowledge under consideration. Statements falling in Category 1 are in agreement with conventional science, while for those in Category 2, a conventional science explanation is likely, but not yet to hand. Knowledge falling within Category 3 displays an incomplete or distorted link with conventional science, while those in Category 4 cannot be explained in terms of conventional science. Background knowledge falling in the last two categories is likely to present the greatest challenge for the acquisition of the concepts of conventional science, since these types of knowledge are in obvious conflict with science. Jegede (1995, 1998) has used the term "collateral learning" to refer to the existence of two or more conflicting schemata in long-term memory, and proposed the theory to explain why science students in non-

Western settings sometimes experience cognitive dissonance.

The theory suggests a continuum of possibilities of the outcomes when these conflicting schemata meet. At one end of the continuum is what Jegede terms *parallel collateral learning.* In this situation, the learner is able to hold the two conflicting schemata with minimum interference. There is no interaction between them and, therefore, there is complete compartmentalisation of the schemata, and the individual is able to access at will that which best suits the context. At the other end of the continuum is the situation where the learner is able to give consideration to both schemata, and to resolve the conflict between them. The strategy used may be either finding good reasons for holding on to both, or incorporating some aspect of one schema into the other so that there is "convergence towards commonality." This Jegede calls *secured collateral learning.*

In between these two positions are situations which represent varying degrees of interaction and conflict resolution between the schemata. Jegede describes two "points" within this gradation. *Simultaneous collateral learning* occurs when ideas from two worldviews about a particular phenomenon or concept are learned at the same time. Learners may be presented with schemata from their traditional knowledge as well as their school science base simultaneously, and take some time to sort out what is to be learned. At the second point described, in the process of processing the information, the learner draws on ideas from conventional science to modify existing schemata. This seems to be an unconscious activity which results in new knowledge, *and dependent collateral learning* is deemed to have occurred.

Jegede's theory suggests possible final situations after a process of exposure to conventional science for students with a traditional knowledge base. If, as the present authors advocate, the important outcome of learning in science, in the face of conflicting traditional prior conceptions, is that two sets of knowledge become available to students for use, then coping strategies and approaches must be devised, so that meaningful learning is the result of the teaching/learning effort.

Such approaches and coping strategies must include attempts to bridge the gaps between the two systems or, in the current parlance, to effect border crossings (Costa, 1995; Phelan, P., Davidson, A., & Cao, H., 1991). Traditional knowledge and school science represent sub-cultures between which students must move, and it would be expected that different students would accomplish this movement or crossing of borders with varying levels of ease. Costa (1995) found four "levels of ease," with which students cross these borders and described the students at each level as:

(a) *Potential Scientists* - where movement between sub-cultures is smooth because of the congruence between the cultures of family and science. These students perceive high school science to be necessary and important.
(b) *Other Smart Kids* - where the two cultures are somewhat different, but near enough so that transitions are manageable. However, these students question the value of science in their personal lives.
(c) *"I Don't Know" Students* - where the cultures are different, and crossing over tends to be hazardous. These students regard science as just another school subject.
(d) *Outsiders* - where the cultures are so different that transitions are very nearly impossible. Often, these students dislike science.

All of the above suggest that students and teachers *both* need to be aware of, and have the time and opportunity to examine, the concepts and values being promoted by both the traditional wisdom and conventional science with regard to particular phenomena, if conflicts are to be resolved or managed, and border crossings effected smoothly.

(2) Factors impinging on students' thinking and reasoning processes

Differences between the intellectual patterns in traditional knowledge and conventional science will affect students' understanding of the nature of science. Acculturation, in a situation which promulgates the syndromes of immediacy and directness which characterise the cause/effect system in the traditional world, is likely to make it more difficult for children to appreciate the concept of variables, with separate and interactive effects. As well, the characteristic tentativeness of science, and its openness to question, would not be easily understood by students accustomed to a culture of easy generalisations, and the authoritarian dissemination of dicta from elder to child. The importance of keen observation, and the necessity for the repetitiveness which establishes the credibility of empirical evidence, which is central to conventional science, may not seem important to the child steeped in traditional knowledge.

Further compounding the difficulties are those situations where intellectual patterns in the traditional knowledge have no parallel in Western science. The ability to transfer ideas/explanations and experiences across contexts has no parallel in Western science. Neither does the ascription of special powers to certain conditions or objects.

What has to be realised if the student is to be assisted in making "border crossings" is that the traditional system is espousing values that are often *different* from those promoted by conventional science.

(3) Student attitudes

The authoritarian passing of dicta from elder to child, to which reference has already been made, means that many aspects of traditional knowledge are accepted on faith, because of the weight of societal authority behind them. The justification for explanations is often based on authority and personal experience. This encourages an attitude of acceptance which is at variance with the questioning stance characteristic of science.

Some students are, however, at a point where they abstract concepts from conventional science, to create a "mix" with the traditional in proposing their explanations. So the situation is changing, especially as media influence tends to erode the traditional respect for the elders, and hence complete acceptance of their dicta.

All of the above suggest that students/learners should:

(a) be encouraged to air and discuss their beliefs with regard to scientific topics/phenomena/principles being studied at any particular time;
(b) be given the time, opportunity, and learning environment which allow them to examine the particular beliefs and science content for possible linkages;
(c) be allowed to explore how well these linkages hold in related concrete situations;
(d) be assisted in dealing with the intellectual outcomes of the exploration suggested at (c).

Implications and recommendations for the teacher

(1) The beliefs of the teacher

It is often forgotten that teachers, for the most part, share a similar cultural background with the children they teach. They are also, therefore, making sense of conventional science from the same kind of belief base. This fact must influence the teaching/learning situation. Teachers must, therefore, have (a) a reasonable understanding of the nature of science and (b) some appreciation of the general characteristics of the worldview that prevails, both in the setting from which they originate, in order to understand their personal worldview, and in the setting in which they teach, in order to treat with the traditional knowledge of the students.

(2) Recognition of the characteristics of the two systems in the teaching/learning situation

Recognition of these characteristics as they pertain to particular phenomena will not be an easy task. Superimposed on this need is the ever present necessity to match pedagogical strategies to age groups and varying levels of ability. Teachers should, therefore, have an appropriate level of competence, in terms of both skills and conceptual understanding in science and in the traditional beliefs, to suit the intellectual level of the students and their cultural setting.

Both points above have consequences for teacher education. Some recommendations in this regard follow:

1. Teacher education programmes should expose teacher educators, teachers, and teacher trainees to the sources and nature of traditional beliefs and practices in their respective cultural settings. These persons will need to understand the general characteristics of the worldview that predominates in their cultural setting, and how these characteristics are similar to, or different from, those of conventional science.

2. Such programmes should also allow time for some consideration of how to establish links with conventional science topics. For example, there are a host of admonitions about temperature changes which could tie into considerations of human temperature regulation. How such admonitions/beliefs are treated as a means of putting across concepts in science would be dependent on what they are, and how nearly the concepts they suggest coincide with those of conventional science.

3. Establishing links between the traditional worldview and conventional science necessitates a knowledge of both. Past research in both the developing world (e.g., George,

1995b) and the developed world (e.g., Rennie, 1987) suggests that science teachers often have incomplete understandings of the nature of conventional science, despite exposure to a bachelor of science programme. It should, therefore, not be assumed that teacher trainees in science have an appropriate conception of the discipline. Teacher education programmes should allow for the exploration of the nature of the discipline, and for looking at the concomitant implications for teaching it.

4. Running parallel to this sort of exposure must be programmes for developing the understanding and pedagogical skills which would allow teachers to make maximum use of the potential of the sayings/beliefs for promoting an understanding of science. This might be for the introduction of new concepts, for reinforcement, for illustrating the social relevance of science, or for appraising explanations of concepts in the two systems where they differ.

Consequences for the curriculum

If there is a concern for students to regard science as an integral part of daily living, then curricula should be designed to offer opportunities for teachers and students to probe the traditional beliefs in their societies, which are part of their daily life.

In practice, the syllabi for the external examinations held in the region become the "curriculum" for the fourth and fifth years of secondary school (Grades 10 and 11). George and Glasgow (1989) analysed the biology, chemistry, physics, agricultural science, and integrated science, single and double award syllabi of the CXC for evidence of just such opportunities. Six areas of science-related content from the traditional data were used in the analysis, namely,

- child rearing practices and injunctions
- food and nutrition
- pregnancy, birth, and postnatal care
- temperature changes
- changes in the physical environment
- household practices

The authors found that in most of the topic areas in the sample examined, the indications were that there was enough opportunity in the CXC science programmes for probing the traditional. The conventional science topics that would facilitate such probing included:

- diet and digestion
- homeostasis
- lightning and light
- earthquakes
- acids, bases, and salts

There were some traditional practices that could be linked to the conventional science topics of surface tension and the factors affecting boiling point. These conventional science topics were not covered in any of the CXC science syllabi. This, therefore, means that the opportunities for teachers and students to explore these traditional practices in science classes might be limited.

The authors are unaware of any similar analysis of school science curricula at a lower level. Typical school science curricula, even when they claim to focus on the life of the child, do so only in a very oblique way. The obsession with preparing students for studying science at higher levels seems to overshadow attempts at genuinely situating the curriculum in the life of the student. The recommendation is made that an orientation to science curriculum development that actively considers the traditional background experiences of students is highly desirable for Caribbean students.

Suggestions for Research

In light of the foregoing discussion, and the fact that science education research in this area is in a fledgling state, the following suggestions are offered as components of a relevant research agenda:

(1) There is need for science-related traditional knowledge of the Caribbean to be documented and categorised on an on-going basis, and for the material to be made accessible to those engaged in all aspects of science education.

(2) The deeper analysis of the similarities/differences/ congruence between the traditional and conventional science understandings/explanations/worldview as it pertains to various areas of science curricula also needs to be continued. Exploration of the two areas in (1) and (2) above is basic to any further research.

(3) The dynamics of the interaction between students' prior conceptions and school science in the teaching/learning situation are yet to be fully understood. How children resolve the differences between the two "sets" of conceptions is an area for deep and continuing study. Does the theoretical construct of "border crossings" (Costa,1995; Phelan et al., 1991) answer the local situation? Does Jegede's (1995) theory of "collateral learning" help to explain how children in Caribbean society cope with the traditional Western viewpoints? Detailed classroom observation of the use of traditional knowledge and conventional science concepts in science is necessary to help to further inform us on these areas.

(4) Whatever the state of knowledge of the two systems, it is acknowledged that there are "gaps" which need to be bridged. Devising pedagogical strategies which can

accomplish this bridging is a present and urgent need. One avenue may be through indigenous technologies.

(5) The authors have found that dialogue with colleagues in the field of language has been a rewarding and informative exercise for their work in science education. This experience is the genesis of the suggestion for extrapolation of the findings about science-related sayings to research in other disciplines. This can only lead to a more holistic societal picture, beneficial to a deeper understanding of the traditional belief system.

In Closing

In sum, the thesis the authors have been attempting to advance in this work is that Caribbean people should be comfortable intellectually and emotionally in the traditional as well as in the scientific world. They encounter concepts from both ways of explaining natural phenomena in their everyday lives and, in fact, are constantly switching from one mode to the other. Therefore, they need to understand the concepts, principles, thinking, and reasoning processes put forward by both "ways of knowing," so that they make informed choices for their behaviour and lifestyles. In other words, there is need to obliterate what UNESCO terms "cultural violence."

This concept of being at ease in both cultures, espoused by the authors as early as 1988, has since been called a "conceptual ecocultural paradigm." This approach to teaching science has since been recommended for Africans, Sri Lankans, Native Americans, Native Alaskans, Japanese, and even for all pupils by two authors (Jegede & Aikenhead, 1999).

The task is not an easy one, and demands constant observation and re-interpretation of data to facilitate the exercise. One captive audience for the study of how to promote this mental switching between two worlds, is the school population. Educators in general, and science educators in particular, can do no less than support research and action in this regard.

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Appendix

Selected Examples of Beliefs From Jamaica and Trinidad and Tobago

1. You must cover all mirrors during a storm or else the lightning will bounce off the mirror and kill you.
2. Water (in a container) is colder than its surroundings.
3. If there is a spell of very hot days, an earthquake is likely to occur.
4. If one uses the fingers only, and not the palm of the hand as well when planting yams, the tubers will be formed just like the fingers.
5. When one is young and plants seeds, they will not bear well.
6. Certain foods when eaten together will cause death, e.g.,
   ripe bananas and rum
   cornmeal and rum
   ripe bananas and butter
   mammee apple and butter
   pomeracs (pomegranates) and ripe bananas
7. Eating the head of fish frequently will make you more intelligent.
8. Nightingale soup makes a baby talk quickly.
9. If a man drinks a lot of seamoss, he will become more virile/fertile.
10. If a pregnant woman eats plenty of ochroes, she will have her baby easily.
11. If an expectant mother drinks a lot of milk, the baby will be light-coloured.
12. Do not bathe/get wet/put your hands in water after ironing/cooking/baking, or you will catch a cold. You should "cool off" first.
13. When coming in out of the "dew," never go near to a baby because the dew would fall on the baby and cause sickness.
14. A woman/girl should not bathe while she is having her period; she will catch a cold.
15. A menstruating woman/girl should not pick fruits from trees or else the fruit of those trees will be sour in the future.

16. Cocoa and chocolate "rot" the bones.
17. Too much salted food makes you meagre/sucks out your blood/ dries out the skin.
18. Drink a hot beverage after coming in from the sun; it will cool you down.
19. If bamboos are cut when the moon is shining, termites will attack them.
20. If you go out after dusk, "dew" will fall on you and you may catch a cold.
21. "Dew water" used to bathe sore eyes will make them better.
22. The best days for fishing are when the moon is in the watery signs--Cancer, Scorpio, Pisces. Fish are more active at these times.
23. Susumber *(Solanum torvum)* purifies the blood.
24. The navel string (umbilical cord) should be buried under a coconut tree; the tree will then bear many fruits.

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