RUNNING HEAD: EVERYDAY INFLUENCES AND HEALTH

How Everyday Activities Influence Children's Ideas About Health

Suzanne Reeve and Philip Bell

University of Washington, Learning Sciences Program

LIFE Center

sreeve@u.washington.edu; pbell@u.washington.edu

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

Abstract

In this paper, we explore children's meanings for the terms "healthy" and "unhealthy." We argue that incorporating personal health into science education is not only fitting in terms of content and process domains, but also in line with recent calls for a focus on science literacy. We report on the results of a self-documentation task in which thirteen children were asked to photograph and write about the range of things they encountered in everyday life that they considered healthy and unhealthy. We present a brief review of results across the children, and then describe two in-depth case studies, focusing on the significant learning influences the children cite. The analysis shows how everyday experiences and activities can have great impacts on children's health understandings, and suggests that such everyday understandings create opportunities for science educators to connect to and build upon.

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

Introduction

It has been widely recognized over the past three decades that the time children spend out of school has a strong influence on their construction of knowledge and orientation toward learning (e.g., Bransford, Brown & Cocking, 2000), and that classroom instruction can be made more effective by grounding it in questions and themes that are relevant to children's everyday lives and existing conceptions (e.g., Dewey, 1900/1990; Sawyer, 2006; Saxe, 1990). Current accounts of K-12 science learning focus heavily on classroom settings, with relatively little emphasis on how and when learning happens in non-school contexts. We need better understandings of the learning trajectories that occur across the settings of young people's daily lives and the kinds of activities and social actors that help to shape their ideas.

This paper examines such everyday influences on two children's understandings of the terms "healthy" and "unhealthy." Our analysis, and the previous work on which it builds (Bell, Zimmerman, Bricker, & Lee, 2006; Reeve & Bell, in press) offer empirical accounts of science-related learning in non-formal, home settings.

Why Health?

In United States schools, science and health are typically taught separately. Perhaps dating back to a post-Sputnik focus on disciplinary scientific knowledge (accompanied by a de-emphasis on knowledge that is more broadly applicable to everyday life), health as a content area has rarely been included in the last several decades of science education research and curriculum development. However, understanding the workings of the human body requires sophisticated understanding of biology, chemistry, and physics. Critical thinking skills and an understanding of scientific processes and methods are also necessary for evaluating the health claims and

reports that are almost ubiquitous in today's media (including television commercials, television programs and news reports, articles in newspapers and magazines, well-known books, etc.).

A focus on personal health in science education also supports the call of recent articles and standards documents for science education to focus on producing citizens that are "scientifically literate" (e.g., AAAS, 1993; National Research Council, 1996). As described in the United States' *National Science Education Standards* (NRC, 1996), "Scientific literacy is the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity" (p. 22). Personal health is clearly an area in which scientific literacy is increasingly vital (Nielsen-Bohlman, Panzer, & Kindig, 2004). The incidence of conditions such as diabetes, asthma, and obesity, especially among minority populations and people living in poverty, have reached epidemic proportions (e.g., Centers for Disease Control, 1996; Okie, 2005). In the contemporary societal context, education for science literacy must include the scientific content and the analytical thinking skills students will need to make sound health decisions throughout their lives. We focus here on young people's understandings of the concepts "healthy" and "unhealthy," as a first step towards creating better connections between school and non-school experiences in a personally consequential domain.

Previous Research on Children's Understandings of Health

A more extensive review of literature investigating children's ideas about the concept of health and illness appears in Reeve and Bell (in press). In this paper, we summarize some of our main lines of existing research and how our current analysis adds to their findings.

One area of focus in studying young people's ideas about health arises out of medicine

and health education. Many of these studies use clinical or semi-structured interview protocols, and focus on a developmental stage model of health understandings between the ages of approximately four and fourteen years (e.g., Koopman, Baars, Chaplin, & Zwinderman, 2004; Perrin, Sayer & Willett, 1991; Bibace & Walsh, 1981). As Kalnins and Love (1982) point out, however, these studies often treat health and illness as two ends of the same continuum, disregarding broader dimensions of the concept such as the ability to do desired things, cleanliness, emotional health, and so on. Natapoff (1978) and Boruchovitch and Mednick (1997) illustrate that young people's ideas encompass physical health and sickness, but also many of the additional aspects mentioned above. Wetton (e.g., MacGregor, Currie, & Wetton, 1998; Wetton & Moon, 1988) used a draw and write technique to allow even very young children to communicate the meanings they associate with health. The perspectives obtained from her work have been used to design health education curricula in the United Kingdom, using as starting points the ideas that young people indicated were important to them.

In the field of developmental psychology, researchers such as Carey (1985) and Keil, Levin, Richman, & Gutheil (1999) have elicited children's developing knowledge over time about the interior of the body. This work shows children expanding their understandings over time of both what organs and systems are inside the body and how the human body relates to other living things (i.e., similarities and differences based on category relationships, such as mammals, insects, and so on). It also relates to studies by science education researchers about conceptions of bodily functions, such as digestion (e.g., Teixeira, 2000). Also in the area of science education, both Au and Romo (1996) and Keselman, Kaufman, Kramer, & Patel (2007) have incorporated health (in these cases focused around the AIDS virus) into science curricula, using causal mechanisms and viral biology to increase students' understandings of AIDS more

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

than was seen with comparable control groups.

Though the literature about children's ideas of health is extensive and both methodologically and theoretically diverse, there are very few accounts of how children come to develop the meanings they have. Cross-sectional studies show meanings that emerge over time in the sampled populations, but without detailing how changes were effected. Learning processes, especially those occurring outside of formally structured settings, have rarely, if ever, been outlined to determine the kinds of influences, activities, and ideas that result in young people's thoughts about health. The analysis presented here uses two children's own words expressed in an open-ended interview, coupled with observations of their everyday lives over a period of at least one year, to help create this picture.

Theoretical Frame

Through the study of children's learning in one urban, multicultural community, our work lends insight into the contributing and interfering influences of formal and informal learning environments in the development of *everyday expertise* (Bell, Bricker, Lee, Reeve, & Zimmerman, 2006). We take everyday expertise to involve a complex coordination of conceptual ecologies, identities, motives, practices, and cultural resources for locally meaningful or consequential purposes, including understanding and making decisions about personal health. This everyday expertise framework recognizes the profound influence of culturally-patterned activity systems (cf. Goffman, 1961) on the development of children's conceptual ecologies as they engage in peer and family events that are co-constructed through talk and interaction (cf. Gutiérrez & Rogoff, 2003). It takes conceptual change to consist not merely of replacing false ideas with correct ones in a one-to-one manner, but of changing the organization of knowledge

networks by introducing new ideas and restructuring connections between existing ones (diSessa, 2002). Our approach is both sociocultural and ethnographic in nature, seeking to understand meanings from participants' point of view and illuminate the contexts in which consequential learning takes place.

Research Questions

This paper addresses two main research questions:

1. What does the word "healthy" actually mean to these two young people?
2. How are their meanings for this concept formed by and/or incorporated into their everyday activity systems?

Methods

The two children described in this paper are part of a larger, child-centered ethnography investigating young people's everyday encounters with science and technology. Since our research began in the spring of 2005, we have assembled a unique data corpus consisting of over 1800 hours of in-situ videorecording across social settings (homes, classrooms, neighborhoods, etc.), participant-observation, structured interviewing, and member self-documentation approaches.

The thirteen focal participants in this larger study are from an urban area of the Pacific Northwest USA (pseudonym Granite Hills) that is ethnically, linguistically, and socioeconomically diverse. In the elementary school from which students were recruited (pseudonym Granite Elementary), approximately two-thirds of students are of Asian descent,

with smaller percentages of Latino, Black, White, and Native American students. Approximately sixty percent of the school's students qualify for free or reduced-price school lunches.

In the winter and spring of 2006, the thirteen fourth- and fifth-grade participants in our study were each asked to document the range of things they might encounter in their lives that they consider to be healthy and unhealthy. We loaned each participant an inexpensive digital camera and a small spiral-bound notebook to record their ideas, and asked them to complete the task within one to two weeks. We asked the children to photograph mostly things, not people, and requested that parents and children review their photographs together and delete any pictures they did not want our research team to see. Other than these constraints, we encouraged the children to record any objects or images they considered related to healthy or unhealthy.

On our next home visit, researchers debriefed each child's pictures and notebook entries with him or her through an ethnographic interview, asking the child to explain why he or she chose the item, where he or she typically encounters it, beliefs and justifications about the item's classification as healthy or unhealthy, and the child's account of where he or she might learn or has learned about it. These sessions were video- and audiorecorded (Reeve & Bell, in press).

Each videotaped interview was transcribed by the first author, and examined for (a) meanings of health offered by each individual participant, (b) cross-cutting themes appearing in multiple interviews, and (c) sources cited by the children for their ideas. For the two case study analyses presented here, prominent sources of health meanings were identified (i.e., recurring at least three times throughout the interview) and the larger corpus of videotaped, audiotaped, and fieldnote-recorded data relative to each child was then searched for confirming or disconfirming evidence of how these influences may have helped to form the children's accounts of health.

Analyses of portions of this data set have already been presented: three child case studies

were presented at a previous NARST conference (Bell, et al., 2006), and a summary of health meanings across all thirteen children, along with one more in-depth case study, is forthcoming (Reeve & Bell, in press). This paper focuses on the health meanings and learning trajectories of two additional children, selected because of the striking and pervasive influence of home activity systems on these children's health understandings. Because of the breadth and depth of our total corpus, we are able to corroborate interview responses with observations of lived behavior to create a more holistic picture of how the concepts of healthy and unhealthy appear in each participant's life.

Findings

Two case studies are presented in this paper, illustrating the significant learning influences on these children's conceptualizations of personal health. The two children profiled, Bob Dayo and Wendy Chung, were both in fifth grade (ten years old) at the time of this interview. Each of them cited significant non-school influences on their ideas about health that were visible and pervasive in our observations of the children at home. The main sources Bob cited for his ideas were the media, including news, commercials and educational shows; school; and exposure to his mother's career as a home-based distributor of health-related products. Wendy attributed most of her meanings to conversations with and observations of her parents. An ongoing concern for healthy eating and lifestyles in the Chung home has helped to form Wendy's understandings of the foods and food preparation methods that contribute to wellness.

Case 1: Bob Dayo

Bob is a ten-year-old boy of Filipino descent. He was born and raised in Granite Hills. He lives with his mother, Brianna, who immigrated to the United States from the Philippines as a

teenager, and a college-aged foreign exchange student they have hosted for close to one year. Brianna had a successful career in retail finance, but approximately two years before Bob enrolled in our research study, she decided to become a full-time, home-based distributor of health-related products. Bob has chronic food allergies and suffers from eczema, and both Bob and Brianna use the health products she sells in their home.

When asked to document the range of things he considered to be healthy or unhealthy, Bob took photographs of or wrote in his notebook about seventeen items, including foods and beverages, plants, alcoholic beverages, and methods of food preparation. An additional seven items came up in conversation during the interview, including air pollution, smoking, and additional foods and means of cooking. The meanings Bob associated with health related to causes of specific illness or injury, weight gain, environmental health, and nutritional or vitamin content of foods (Reeve & Bell, in press).

Of most interest to this analysis are the three major influences to which Bob attributed most of his understandings about health: the media; school instruction, including science units and school fieldtrips; and his mother's career selling health-related products. We did not tell any of the children in advance that we would be asking where they learned about these items, so their answers were generated in the moment. In the rest of this case, we will elaborate on the kinds of health meanings Bob claimed to have gained from these sources, using ethnographic observation data to substantiate his interview responses.

Bob's school-related health meanings concerned alcoholic beverages ("Wine is bad for you, because you can get drunk, and then you could get like, you might get all, it's like a drug, sort of. It has alcohol in it, and alcohol is bad for you. If you drink too much, you might get sick. And then if you're drinking and driving, you might crash because you're drunk and all ((pause))

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

crazy"); the environmental effects of plants ("they clean out water. When water goes into a tree, the tree keeps the dirt and brings out the old water"); and the difference between eating "good" and "bad" sugars ("Fruits are good for you, because they give you good sugar, which helps you…so then good sugar comes from fruits, but bad sugar comes from like, artificial stuff… candy bars, candy, chocolate"). Through Bob's statements and our observations at his school, each of these meanings comes from a different topic or aspect of instruction, sometimes significantly removed in time from the day of our interview.

Bob said that his ideas about fruit and sugar came from his fourth grade class, in science. Bob's fourth grade teacher teaches an STC science unit each year titled "Food Chemistry," in which students conduct investigations about starches, glucose, fat, and proteins. A booklet accompanying the kit, from which the children frequently read, contains a section on different types of sugars and their various effects on health. Bob experienced this unit approximately one full year before our interview, but mentioned it explicitly as a source of his ideas.

Bob said that his ideas about plants are derived from a television show (described later) and a fieldtrip he took in fourth grade to a local water source; again, the incident to which he attributed this idea occurred over a year previously. Though we did not witness classroom instruction with Bob about alcohol, we know that the health curriculum his elementary school uses includes such lessons, and have observed instruction about harmful drugs with other students at the school.

Bob attributed his knowledge to the media more frequently than any other child interviewed in our study. This included the educational television program "Magic Schoolbus," where he learned about plants taking in carbon dioxide, giving off oxygen, and cleaning the air; the news, where he learned that "corn syrup is bad for you"; and the children's television show

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

"Arthur," to which he attributes his ideas about the benefits of drinking milk and water. During our visits to Bob's home, we frequently saw him watch television after school or during summer vacation, and he could often tell us quite accurately the broadcast schedule of shows airing during the times he likes to watch. Describing a family trip to Hawaii two months after our interview, Bob told us:

> *1. Bob:* Most of the time [we spent] outside, and then when we stayed inside I watched TV.
>
> *2. Researcher:* You did?
>
> *3. Bob:* Because it was CABLE, so I had to take advantage…
>
> *4. Bob:* And then I found out how they make poi. There's this thing called poi? It's like you mash taros to get taro together, and then, yeah, it's really soft. It's like, yeah. It never spoils, just gets really really really sour.
>
> *5. Researcher:* Oh, wow.
>
> *6. Bob:* And then to make it less sour, you put more taro in to get, yeah…
>
> *7. Researcher:* So how did you learn how to make poi? Did you see it on TV, or did you?
>
> *8. Bob:* I was flipping channels, and I saw it.

This incident illustrates the significant time Bob spends watching television, and how he learns from some of the programs. It also fits in with Bob's assertion during our interview that he sometimes watches TV shows about food or nutrition.

Looking at just these first two self-acknowledged influences on learning, school and the media, we begin to see a picture of Bob drawing on experiences across time, place, and context in constructing ideas about the concept of health. Over the course of a 35-minute interview, he called up and accessed a diverse network of knowledge units and activities.

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

Beyond school and media, however, the health-related influence that seems broadest and most pervasive in Bob's life is his contact with his mother's occupation as a distributor of health-related products. From our very first visit with the family, when we sat down for an informal conversation, Bob co-constructed with his mother Brianna the account of her work and the benefits of the products she sells. He brought into the living room a bottle of the health drink she distributes for us to see (pseudonym Healthy Life), as well as a related article from a popular newsmagazine. When one of the researchers asked about the relationship between Healthy Life and a similar drink containing a tropical fruit called noni, Bob stood up and replied, pointing to the bottle, "That has noni…it has noni in it, and more." Laughing at Bob's excitement, Brianna added, "And I guess, you know, with…this business that I'm in, he tends to learn a lot from what I'm doing." Brianna hosts openhouses for Healthy Life at least once a week in their home, makes frequent phone calls to clients, and takes part in conference calls several times a week, sometimes multiple times per day. Since the conference calls are often on speakerphone, Bob overhears the testimonials and advertising messages to distributors around the world. As researchers, we have been present for a number of these conference calls and for one of the product openhouses and have heard the sales-oriented discourse, rich with claims about the health and science behind the product, to which Bob is frequently exposed. Both Bob and Brianna take Healthy Life daily; Brianna told us that it has helped her recover from migraines and helped Bob with his eczema, as well as increasing his focus and energy.

For our photodocumentation task about healthy and unhealthy, Bob photographed both a bottle of Healthy Life and a cooker from the Best Made line of cookware his mother has also sold. During our interview, he described extensively the features and health-promoting properties

of each. For example, about the bottle of Healthy Life, Bob and a researcher had the following exchange:

1. *Bob:* It's a drink that comes from [a South American village]…So then, the fruits there are better than the ones here cause they're better potency, so that they have a higher defense mechanism. So, it defends them from heat and other bugs. Also the water, so, like, it trickles down into different pools, and then in those different pools it takes out different bacteria, so that when it gets down, to the actual…place that they get it from, it's all fresh. And, they say it's so fresh that it's sweet…
2. *Researcher:* So is this something that's healthy or unhealthy?
3. *Bob:* Healthy.
4. *Researcher:* So why do you think it's healthy?
5. *Bob:* Because the fruits and the water there are much potent, more potent. So they crush it all and then put it into a drink. And drink it. It has all the vitamin Bs, A, stuff, and yeah, zinc.

Bob's description of the Healthy Life drink mirrors the company's claims that it is certified to contain especially clean water and natural fruits containing high levels of vitamins, minerals, and antioxidants. His knowledge about this drink reflects at least a partial understanding of a variety of scientific concepts relating to nutrients, bacteria, and their effects on the body; if connected to a classroom context, Bob's ideas could provide opportunities for further investigations that are associated with his existing interests and experiences.

Bob described the features of the Best Made cookware even more extensively:

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

1. Bob: This is healthy, because when you put like, when you put something fat in it, and you cook it, it can take the fat out…And you don't need water when you're cooking stuff…you should put vegetables instead, because the moisture from the vegetables would go into meat, and like other pots, it would do something different. Like aluminum pots, the aluminum would get into your food and get all nasty, but in here, it's steel, so nothing will melt. And it's seven layers, so it's really sturdy. So you could, instead of water, when you're not making soup, you should put in vegetables so the vegetable moisture will go into that, instead of using water and draining all the flavor out…

2. Researcher: Cool. So how'd you learn about this pan?

3. Bob: (inaudible) My mom. It's the BEST…

4. Bob: And it's surgical stainless steel, and surgical stainless steel is the steel that doctors put into people's bodies to (protect it and?) stuff.

5. Researcher: So does that make it healthier, or unhealthy? The surgical steel.

6. Bob: Healthy. Because one thing it doesn't get stained, it's easier, much easier to take off and clean. And then surgical stainless steel means it's like clean, and it won't melt and go into your food.

As with the Healthy Life drink, Bob's words address biological and chemical ideas. He has learned that chemicals such as aluminum and steel might interact with food, and has been introduced to the idea of fats in foods and how to remove them. In this same exchange, Bob talks about "good" and "bad" fats, with good fats giving energy and bad fats going to the stomach and making a person fat. While his description does not match completely with canonical accounts,

these meanings Bob associates with health again provide an opportunity for connections to be made to classroom instruction.

We have seen little or no direct teaching from Brianna to Bob about the Healthy Life or Best Made products. Rather, Bob appears to have acquired his voluminous knowledge through the frequent talk, use, and display of these items in their home. For the Best Made cookware, Bob's description of health benefits merges seamlessly with features of convenience and increased flavor, which is suggestive of the sales context in which he learned these ideas. Bob's interest in his mother's occupation is illustrated by his desire to, do the same kind of marketing work his mother does as a career when he grows up.

Bob's ideas about health are clearly bound up in a variety of activities and associations, reaching far beyond the time and content devoted to "health" instruction in school. Interestingly, however, Bob tells us that he is not interested in health as a topic, and was impatient with our focus on it in some early tasks and interviews. During school health and science instruction, Bob gives no evidence of the extensive interaction he has with these domains at home; perhaps there is no space made by either the curriculum or instruction for Bob to make connections between his home practices and school knowledge.

Case 2: Wendy Chung

Wendy is a ten-year-old girl of Chinese descent. She was born in Hong Kong and came to the United States as an infant with her parents and two older sisters. Wendy's father, David, is the pastor of two churches, one in Granite Hills and one in a nearby city. The family lives in a home adjacent to the Granite Hills church. Wendy's mother, Grace, was employed as a teacher in Hong Kong, and now works in various support roles for the church, including helping new church members and recent immigrants, and organizing a summer school for young people.

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

There is frequent talk in the home about eating healthy foods, and Wendy often helps her mother and sisters make homemade juices.

Wendy photographed 24 items relating to “healthy” and “unhealthy,” and described an additional eight items verbally during our interview. Almost all of her items related to food; the two exceptions were a description of her gym teacher, who she believed was healthy because he exercises and eats healthy foods, and a photograph of a kitchen towel that could be unhealthy if it contains germs from imperfectly washed hands. The meanings Wendy most frequently associated with health overlapped with some of those described by Bob and other children in our study, including causing or curing specific illnesses, the vitamin or nutritional content of foods, and the positive effects of organic or fresh foods.

Throughout Wendy’s interview, the most pervasive influence on her ideas seemed to be conversations with or behaviors of her parents. Eleven of the fourteen times researchers asked Wendy where she learned about a specific item, she attributed her ideas to her parents, mostly her mother. Below are a few illustrative quotations:

1. *First researcher:* Okay, so we’ve got some organic veggies, and did you say they were healthy or unhealthy?...
2. *Wendy:* Healthy.
3. *First researcher:* Because?
4. *Wendy:* Organic and it doesn’t have…the insect spray, so then, yeah.
5. *First researcher:* Oh, the pesticide?
6. *Wendy:* Yeah, the pesticide.
7. *Second researcher:* How do you know that it's organic?

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS’ PERMISSION

8. Wendy: Because my, well, actually…my mommy says it's organic. Because she said she bought it with the label on…

1. First researcher: Is fish something that you eat a lot of?

2. Wendy: Yeah, because my mommy can't eat a lot of red meat. And fish is white meat, mostly…

3. First researcher: And where do you learn about things like fish being healthy or unhealthy?

4. Wendy: Mama. Or papa.

1. First researcher: So tell us about this picture. ((loaf of white bread))

2. Wendy: This is bad…Because, my mommy says the white bread bad for me because it has, it's like, it's kind of like rice. Like, rice is supposed to be brown or other colors. Not white. Because when it's white it's like bleached, like the bread. Like the wheat, it might have been bleached.

Throughout Wendy's interview, she associated photographs she had taken with the family members who use or eat those specific items, such as vitamin tablets and certain types of breads or cereal. Wendy also stated that, while she took most of the photographs, her mother took a few of the later pictures. As the researchers viewed these pictures without her mother Grace in the room, however, Wendy was still able to articulate justifications for the healthiness of each item, such as whole grain or vitamin content. After describing a photograph her mother took that contained whole grain bread, two different kinds of fruit, and vitamin tablets, Wendy added,

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

1. Wendy: My mommy should have took a picture of a carrot.

2. Researcher: A carrot? Why carrots?

3. Wendy: Vitamin E, I think it was E…because vitamin E makes you see better.

In our observations of Wendy, we have seen frequent family talk and activity centering around healthy or organic foods. During our visits to the Chung home, we are often offered juices or fruit purees that Grace (sometimes with the help of Wendy and her sisters) has made using the family's juice machine. Wendy and her mother both say that they make homemade juices several times a week.

In addition, a few months after our interview, researchers accompanied Wendy and her mother to visit a friend's organic garden and learn about the different kinds of plants there. We also observed Wendy during the summer vacation working on a project her mother had assigned her to research and compare the health effects of brown and white rice. Education assumes a very high priority in the Chung home, and it is not unusual for Wendy's mother to give the children extra school-type work to do, especially during the summer months. In this case, Wendy's mother had been encouraging the family to eat brown rice instead of white rice. Since Wendy did not like the taste or texture of brown rice, however, her mother asked her to research the topic in hopes that she would become convinced of the increased health benefits. Wendy worked with her sister to search the Internet, gather "pros" and "cons" for both brown and white rice, and then come up with a conclusion. Based on the results of this project, the family decided to start using half brown and half white rice, and eventually see if they could move to eating all brown rice.

As discussed above, Wendy's understandings of health appear to have been significantly shaped by the routine conversations and activity systems occurring in her home. Wendy

attributed only three health-related ideas to her school experience: the risk of getting cavities from too much sugar, the health benefits of vitamins, and the possibility that germs from not washing one's hands well enough could make a person sick. In the latter two cases, Wendy stated that she learned about these ideas both at school and at home.

Implications

The two cases described here illustrate the strong and diverse influences that home knowledge and practices can have on children's learning about personal health, as well as the opportunities for educators to make connections with children's everyday lives. For both Bob and Wendy, activities such as watching TV, observing a parent's career, family conversations, and food preparation have shaped their understandings of what it means for something to be healthy or unhealthy. The ideas Bob and Wendy expressed also have clear connections to science learning, both in terms of biological and chemical content and in terms of critical thinking and evaluating competing claims (from television commercials, news, conversations with friends and family, etc.).

The current health curriculum in most schools, divided as it is from science instruction and often without space for children to bring in their rich and diverse prior understandings, does our young people a disservice in this vitally important domain. Education that prepares people for scientific literacy (NSES, 1996) must start with a focus on issues of lifelong personal relevance, such as personal health, and take into account the range of influences on young people's ideas throughout the varied contexts of their lives. The research presented here gives added insight into the processes of two children's non-school learning about personal health, and suggests that science instruction could benefit by incorporating personally relevant issues and

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

explicitly connecting classroom material with young people's everyday beliefs and behaviors.

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

References

American Association for the Advancement of Science/Project 2061. (1993). *Benchmarks for science literacy*. New York: Oxford University Press.

Au, T.K. & Romo, L.F. (1996). Building a coherent conception of HIV transmission: A new approach to AIDS education. In Medin, D.L (Ed.) *The psychology of learning and motivation: Advances in research and theory* (pp. 193-241). New York: Academic Press.

Bell, P., Bricker, L.A., Lee, T.R., & Zimmerman, H.T. (2006). The everyday cultural foundations of children's biological understanding in an urban, multicultural community. Paper presented at the meeting of the National Association for Research in Science Teaching, San Francisco, CA.

Bell, P., Bricker, L.A., Lee, T.R., Reeve, S., & Zimmerman, H.T. (2006). Understanding the cultural foundations of children's biological knowledge: Insights from everyday cognition research. *Proceedings of the Seventh International Conference of the Learning Sciences (ICLS)*, pp. 1029-1035. Mahwah, NJ: Erlbaum.

Bibace, R. & Walsh, M.E. (1981). Children's conception of illness. in Bibace, R. & Walsh, M.E. (Eds). *Children's conceptions of health, illness, and bodily functions* (pp. 31-48). San Francisco: Jossey-Bass.

Boruchovitch, E. & Mednick, B.R. (1997). Cross-cultural differences in children's concepts of health and illness. *Rev. Saude Publica, 31,* 448-456.

Bransford, J.D., Brown, A.L., & Cocking, R.R. (Eds.) (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.

Centers for Disease Control and Prevention. (2006). Diabetes: Disabling, deadly, and on the rise. http://www.cdc.gov/nccdphp/publications/aag/ddt.htm. Accessed 9 October 2006.

Dewey, J. (1900/1990). *The school and society and the child and the curriculum*. Chicago, IL: University of Chicago Press.

diSessa, A. (2002). Why "conceptual ecology" is a good idea. In M. Limón & L. Mason (Eds.), *Reconsidering conceptual change: Issues in theory and practice* (pp. 29-60). Dortrecht: Kluwer.

Goffman, E. (1961). *Encounters: Two studies in the sociology of interaction*. Indianapolis, IN: The Bobbs-Merrill Company, Inc.

Goodwin, M. H. (1990). *He-Said-She-Said: Talk as Social Organization among Black Children.* Bloomington: Indiana University Press.

Gutiérrez, K., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice. *Educational Researcher, 22*(5), 19-25.

Kalnins, I. & Love, R. (1982). Children's concepts of health and illness - and implications for health education: An overview. *Health Education Quarterly, 9*(2-3), 104-115.

Keil, F.C., Levin, D.T., Richman, B.A., Gutheil, G. (1999). Mechanism and explanation in the development of biological thought: The case of disease. In Medin, D.L. & Atran, S. (Eds.), *Folkbiology* (pp. 285-319). Cambridge, MA: MIT Press.

Keselman, A., Kaufman, D.R., Kramer, S., & Patel, V. (2007). Fostering conceptual change and critical reasoning about HIV and AIDS. *Journal of Research in Science Teaching, 44*(6), 844-863.

Koopman, H.M., Baars, R.M., Chaplin, J., & Zwinderman, K.H. (2004). Illness through the eyes of the child: The development of children's understanding of the causes of illness. *Patient Education and Counseling*, *55*, 363-370.

MacGregor, A.S.T., Currie, C.E. & Wetton, N. (1998). Eliciting the views of children about health in schools through the use of the draw and write technique. *Health Promotion International, 13*(4), 307-318.

Natapoff, J. N. (1978). Children's views of health: A developmental study. *American Journal of Public Health, 68,* 995-1000.

National Research Council. (1996). *National science education standards*. Washington, DC: National Academy Press.

Nielsen-Bohlman, L., Panzer, A.M., & Kindig, D. (Eds.). (2004). *Health literacy: A prescription to end confusion*. Washington, DC: National Academies Press.

Okie, S. (2005). *Fed up! Winning the war on childhood obesity*. Washington, DC: Joseph Henry Press.

Perrin, E.C., Sayer, A.G., & Willett, J.B. (1991). Sticks and stones may break my bones…Reasoning about illness causality and body functioning in children who have a chronic illness. *Pediatrics, 88*, 608-619.

Reeve, S. & Bell, P. (In press). Children's self-documentation and understanding of the concepts "healthy" and "unhealthy."

Sawyer, R.K. (2006). Introduction: The new science of learning. In R.K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 1-16). Cambridge: Cambridge University Press.

Saxe, G.B. (1990). The interplay between children's learning in school and out-of-school contexts. In Gardner, M., Greeno, J.G., Reif, F., Schoenfeld, A., DiSessa, A. & Stage, E. (Eds.) *Toward a scientific practice of science education* (pp. 219-234). Hillsdale, NJ: Lawrence Erlbaum.

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION

Swidler, A. (1986). Culture in action: Symbols and strategies. *American Sociological Review, 51*(2), 273-286.

Texeira, F.M. (2000). What happens to the food we eat? Children's conceptions of the structure and function of the digestive system. *International Journal of Science Education, 22*(5), 507-520.

Wetton, N.M. & Moon, A. (1988). Lifestyles -- an education in health. *Westminster Studies in Education*, 11, 59-67.

DRAFT: PLEASE DO NOT COPY OR CITE WITHOUT THE AUTHORS' PERMISSION