Health Is Life in Balance: Students and Communities Explore Healthy Lifestyles in a Culturally Based Curriculum[1]

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Abstract

From exploring knowledge from wise members of the community to investigating the science of homeostasis, students learn healthy ways of living through a new hands-on curriculum, Diabetes Education in Tribal Schools: *Health Is Life in Balance*. The curriculum integrates science and Native American traditions to educate students about science, diabetes and its risk factors, and the importance of nutrition and physical activity in maintaining health and balance in life. Applying an inquiry-based approach to learning, the curriculum builds skills in observation, measurement, prediction, experimentation, and communication, and provides healthy lifestyle messages and innovative science activities for all students. The curriculum is now available to teachers and health educators at no cost through a federal grant.

Health Is life in Balance incorporates interdisciplinary standards as well as storytelling to help children understand important messages. Implementation evaluation of the curriculum indicated improved knowledge and attitudes about science and health, positive teacher and student comments, and culturally relevant content. The lessons highlighted in this article give a glimpse into this hands-on curriculum which integrates science and Native American traditions, looking to our past and listening to the wisdom of our Elders, to gain powerful information for healthy, holistic living. The circle of balance is a theme in many indigenous belief systems and is woven into the lessons, providing enduring understandings of health behaviours that can prevent type 2 diabetes in the context of Native American cultural themes.

Key Words: diabetes education, American Indian/Alaska Natives, inquiry science, K–12 curriculum, culturally relevant curriculum, healthy lifestyles, community health

We need to stop people before they start the diabetes journey. We need to act before people develop the disease. This will be a huge challenge. Affecting the required behavioural change and creating healthy environments will require unparalleled cross-sectoral collaboration. – International Diabetes Federation President, Professor Jean Claude Mbanya, University of Yaounde, Cameroon, at the World Diabetes Congress, Montreal, Canada, October 2009.

Collaboration by eight US Tribal Colleges and Universities and the National Digestive and Kidney Diseases (NIDDK), the Centers for Disease Prevention and Control (CDC) and the Indian Health Service (IHS) has produced a potentially powerful tool for stopping the diabetes journey before it starts by teaching children and teenagers the facts of diabetes and diabetes prevention. Teachers and health educators worldwide now may access a free, innovative K-12 curriculum, Diabetes Education in Tribal Schools: *Health Is Life in Balance*. The curriculum develops enduring understandings of the science of diabetes and the health behaviours that can prevent type 2 diabetes using inquiry learning methods in the context of indigenous cultural themes.

According to the NIDDK (2008), 23.5 million people aged 20 and older or 10.7% of the population had diagnosed diabetes in 2007. American Indian and Alaska Native adults are affected disproportionately with 16.3% of the population having a diagnosis of diabetes. Type 2 diabetes, once considered an adult disorder, is now emerging in all populations of youth in the United States. Among American Indian and Alaska Native youth aged 15–19 years, cases of diagnosed diabetes increased 68% from 1994–2004 (Indian Health Service Division of Diabetes Treatment and Prevention, 2008).

DETS*: Health Is Life in Balance* invites students from kindergarten through 12th grade to explore the science of healthy lifestyles using a science-based inquiry approach. Activities in the lesson units for each grade build skills in observation, measurement, prediction, experimentation, and communication.

This culturally relevant curriculum integrates science and Native American knowledge and traditions, learning about the past and listening

to the wisdom of Elders to gain powerful information for healthy, holistic living. The concept of balance, a widely prevalent theme throughout many indigenous belief systems, is woven into the curriculum, providing healthy lifestyle messages and innovative science activities for all students.

Overview

In this article, we will provide an overview of the DETS curriculum and describe a sample lesson activity from an elementary unit in more detail. The curriculum is designed to build understandings from kindergarten through high school; however, the middle and high school units can be used effectively with students who have not experienced the elementary units.

In the K–4 lessons, which are organized as multidisciplinary grade-level units, students explore the circle of balance in four areas of their lives that promote good health when working together in harmony. They develop understandings of what diabetes is, how it develops, and how it can be prevented and treated. Students find out how glucose comes from food and how it relates to diabetes. In learning the science of healthy food and activity choices, students acquire the skills to prevent obesity and diabetes. The colourful, appealing Eagle Books, developed by the CDC's Native Diabetes Wellness Program, are incorporated into the elementary lessons, using storytelling as a powerful way to reinforce children's inquiry learning.

Students discuss the reasons we eat, and explore the digestive process, thinking like scientists as they investigate how the body uses food. They use graphic organizers to construct the sequence by which food becomes glucose, and depict how the cell draws in glucose from the bloodstream. With greater understanding of diabetes as "having too much glucose in the bloodstream" and how diabetes occurs in the body, students explain everyday ways they can keep themselves healthy. Finally, students investigate energy balance: how energy in (from food and drinks) balances with energy out (from growth and activity) to support natural growth without excess weight gain. Students compare traditional diet and active lifestyle of

early hunter-gatherer ancestors to our present American diet, recognizing science and traditional wisdom, and describe present-day food and activity choices that promote health and prevent disease.

There are two middle school social studies units which develop understanding of the interactions of lifestyle and health for both individuals and communities. Students compare environments and ways of living in the past and present and consider their influences on health. After examining the environments and lifestyles of their own communities, students present suggestions for community actions that support health. In the middle school science unit, students explore how scientists have learned about diabetes and how to treat it, learning about diabetes as they follow the trail of discovery. Students explore the roles of health care professionals in a diabetes clinic and community actions that could help prevent type 2 diabetes.

The high school level science unit uses models to develop understandings of how the body regulates blood sugar, which in turn illustrates homeostasis. In the science unit, personal stories of young people with diabetes portray the experience of living with diabetes, showing how knowledge of regulating blood sugar is used by the students' peers. The high school health unit uses interviewing and data analysis to develop understandings of risk factors and how to reduce some risks through lifestyle changes. Then, students apply the information about risk reduction in role playing activities that explore how health professionals work together in diabetes care and prevention.

The DETS units take about four weeks to complete. Typically, schools supplement their regular curriculum with DETS units. Because the DETS units are aligned with national science, health, and social studies education standards, it is easy to blend them into an established curriculum. The curriculum is a creative approach to helping students live life in balance. It should reduce the incidence of diabetes in youth and improve the care of type 2 diabetes among the population. The DETS curriculum units weave together inquiry learning, exposure to science and health-related careers, and AI/AN cultural and community knowledge.

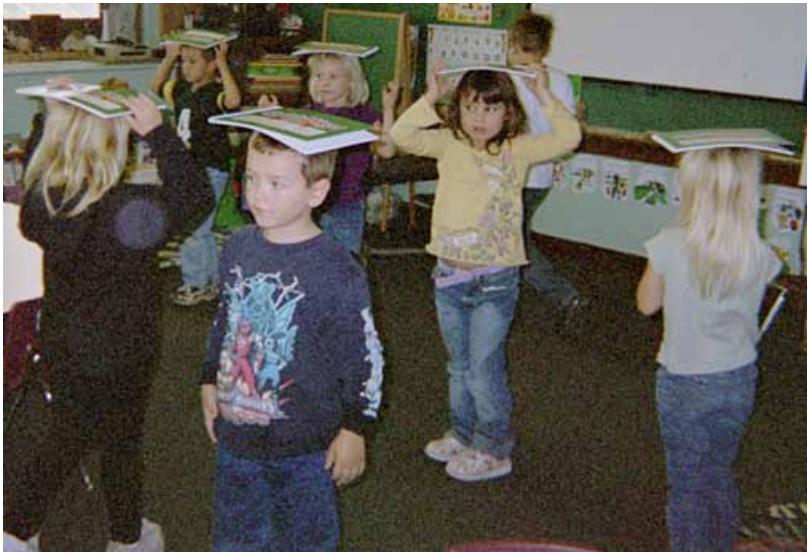
The instructional content of the curriculum units focuses on these enduring understandings:

At the K–4 level, students will

- develop a concept of health through balance in life;
- identify how making healthy food choices and being physically active every day can prevent diabetes;

- explore the concepts of balance and imbalance through learning activities and visual aids and apply these concepts to maintaining health; and
- explore four areas of their lives — body, mind, feelings, and the world — that work together in harmony to promote good health.

All K–4 units are interdisciplinary curriculum units emphasizing health science with strong language arts components; the kindergarten units are suitable for both K and pre-K levels.



At the grades 5–8 level, students using the social studies unit will be able to

- describe lifestyle in terms of dietary patterns, physical activity levels, and personal choices; and
- identify environmental changes that can be made to improve or maintain personal health and the health of families and communities.

At grades 5-8 level, students using the science unit will

- understand, as the result of scientific investigation and the accumulation of evidence, that disease develops slowly across time; and
- understand that diabetes is a disease in which a person's body is not able to use glucose properly.

At the grades 9–12 level, students using the science unit will

- learn through analyzing case studies how the physical, mental, emotional, and spiritual aspects of a person's life are affected when someone has diabetes and how to use those aspects of life plus input from the community to regain balance and health;
- understand by using models how the hormones insulin and glucagon regulate blood glucose levels and maintain homeostasis; and
- understand how problems with the body's use of insulin disrupt the homeostatic regulation of blood glucose and lead to diabetes.
- learn by conducting interviews with community members what others know about diabetes and what misconceptions about diabetes are common;
- participate in role playing to learn about careers in health professions that deal with diabetes;
- learn about the risk factors for type 2 diabetes including which can be controlled through personal behaviour and which cannot; and
- learn that people can reduce their chances of getting type 2 diabetes by making lifestyle changes.

A Sample Unit

The K–12 DETS curriculum includes critical thinking and life-application activities throughout — too many to describe usefully in an article. Therefore, one sample elementary unit, *Being Smart about Being Healthy,* is highlighted here. This unit teaches the dynamic nature of scientific knowledge by help-

ing students voice their knowledge about healthy choices using persuasive science-based communication techniques that reinforce health and prevent illnesses. The students analyze advertising techniques, seek reliable facts about the products, and create their own messages using both facts and advertising strategies.

Outside the classroom, students hear many messages about food choices — few of them designed to promote health. On the average, children watching television will see one food commercial every five minutes, adding up to about three hours of food-related commercials each week. Most of these commercials promote breakfast cereals loaded with sugar, foods high in fat, candy, sweetened soft drinks, and fast food restaurants (Story and French 2004). Consequently, critical thinking about health messages is an important element of the curriculum, and featured in the sample activities.

Effecting changes in children's eating behaviour toward healthier choices in opposition to the multimillion dollar advertising campaigns for foods of questionable nutritional content is a formidable but vital task. As Professor Mbanya stated, it will require collaboration across all sectors. A key role for educators in this collaboration is guiding students in developing the science understandings and critical thinking skills they need to become discerning consumers of foods and providing practice in applying those skills.

Even young students can begin to evaluate products and to understand the motivation behind commercials. They can start learning the science of nutrients, food groups, and portion size to make healthier choices by read-

ing food labels. As they mature, they can apply new knowledge and more sophisticated analysis to their decision-making. Through practicing skills for expressing persuasive arguments for good food choices and physical activity, students can gain deeper understandings of both argumentation and life science.

In this unit, which uses the Eagle Book, *Tricky Treats*, students discover how advertisements sometimes are "tricky" and how they can become smart at making healthy food choices. They analyze advertisements for

strategies including: games or promotions, use of celebrities cartoon characters, free toys or trading cards, wearable advertisements, exaggerated health or beauty benefits, bright colors, etc. Students examine nutrition labels and rank products based on the amounts of sugar, fat, and fiber contained in the food. Scientists have discovered that people who eat the lowest fiber and the most sugar, fat, and refined starches have a higher risk for diabetes (Willett et al. 2006). Students evaluate which foods are everyday foods and sometimes foods.

In this culminating activity, students have the opportunity to demonstrate what they have learned by planning, advertising, and conducting a celebration feast which features healthy food choices and physical activity.

Outcomes and Indicators of Success

By the end of this activity, students will demonstrate their understanding by

- planning a menu for a feast and selecting healthy foods
- comparing their menu to the MyPyramid food choice recommendations

- designing an advertisement or commercial for their feast, highlighting healthy foods and physical activity
- performing their commercial or advertisement for their class and guests
- explaining their good food choices to guests of the celebration feast, and
- demonstrating the Round Dance as a physical activity to promote good health

In addition to these authentic assessments of student learning, the Teacher Resource CD provided with the curriculum has samples of written tests for teachers to use in classrooms.

Let's Celebrate!

1. *Break the students into groups of three or four depending on the size of the class and ask groups to brainstorm ideas for creating a feast within their community. Each group will:*

- Determine the types of food and physical activity they will have at the feast.
- Conduct a search through the grocery store (or magazines) for examples of specific foods they want to include in the feast.

- Divide selected items into specific food groupings, and evaluate if they have planned a balanced meal with correct portion sizes
- Invite parents and community members to attend, celebrate community diversity, and enjoy students' learning and creations.

2. *At the opening of the celebration feast, remind students to take time to show respect and thanks for the food and each other.*

An important part of every meal is taking a moment before eating to give thanks for the food — showing appreciation for the food itself, for the labour of those who produced and prepared it, for the animals and plants that gave their lives to nourish us, and for the earth that gave us the gifts that made it all possible (water, soil, air, rain, nutrients). It promotes good environmental stewardship in thinking about protecting our resources so we can enjoy colorful, healthful, nutritious foods whose flavors delight our mouths.

3. *Students explain how they planned a healthy meal or snack for the celebration and demonstrate to the visitors how to easily measure the recommended portion size using their hands.*
4. *Using persuasive advertising techniques that advertisers use, students act out an ad or commercial for nutritious foods and physical activity as part of a balanced life.*

Students create a skit for a commercial or design an advertisement on paper by drawing or cutting out pictures and pasting them on the paper. Then

present their advertisement or commercial it to the guests at the celebration so that they can to elaborate on what they have learned.

5. *Students lead the guests in a Round Dance, a friendship dance of unity.*

Dancing is an important part of the celebration feast and a fun, healthy physical activity. Have the students practice a simple round dance in preparation for the feast. Explain to students that Native Americans have used this dance for many years to celebrate friendship and unity among all people. It is also used to celebrate balance in life and health. The round dance drumbeat sounds like a heartbeat. The beat will speed up as the dance gets faster, just as your heartbeat speeds up when your body is working hard. Have the students hold hands in a circle and move one small step to the left (clockwise) when they hear the drum beat. Then have the students let go of each other's hands and increase the speed of the beat so that all students are dancing vigorously. Students may move their arms in front of them in a motion like scrubbing clothes on a washboard or shake rattle-type rhythm instruments in time to the beat as they dance.

6. *Challenge the students to propose their own list of "smart snacks" that the school can have available for students.*

As a class, construct a list of five healthful snacks that students can eat every day based on what they learned about nutritional components, food groups, and portions.

Research Methods

Diabetes Education in Tribal Schools: *Health Is Life In Balance Curriculum* was tested in collaboration with 63 American Indian/Alaska Native and non-Native teachers and 1,500 American Indian/Alaska Native and non-Native students across 14 states using a three step process of pilot testing, beta testing, and finally implementation testing.

The implementation test of the DETS curriculum was conducted by eight Tribal Colleges and Universities (TCUs) and seven "Sister Sites" (Tribal Nation participants beyond the immediate regions of the eight TCUs), in classrooms during the fall 2007 and winter 2008 school semesters across 14 states: Arkansas, California, Florida, Kansas, Montana, New Mexico, North Dakota, Oregon, Michigan, Minnesota, New York, South Dakota, Washington, and Wyoming.

The school settings testing the curriculum were mostly small rural tribal or public schools with a 50–100% AI/AN student body. Schools were typically on reservation land or in close proximity based on geographic locations of the participating TCUs and Sister Sites. The data collection process followed guidelines of all agencies involved for protection of human subjects with strict sensitivity to the anonymity of individual students and teachers.

To measure knowledge and attitude gains, pre-post standardized assessments were used in all participating classrooms. A national evaluation study (Dodge Francis et al. 2009) examined the success of the implementation of the Diabetes Education in Tribal Schools (DETS) K–12 curriculum relative to three goals:

1. Increase the understanding of health, diabetes, and maintaining life in balance among American Indian/Alaska Native students *(Teach about diabetes)*;
2. Increase American Indian/Alaska Native students' understanding and

application of scientific and community knowledge *(Value and use scientific and traditional knowledge)*;

3. Increase interest in science and health professions among American Indian/Alaska Native youth *(Encourage science and health careers)*.

Evaluation Results

Data were collected at three grade bands: elementary (25 teachers, 386 students), middle (23 teachers, 893 students), and high school (15 teachers, 240 students). Results indicated pre-to-post achievement gains at all grade-levels (elementary, middle, and high school).

Student Data

Goals	*Elementary*	*Middle*	*High School*
1 *(Teach about diabetes)*	Pre-post statistically significant gains (t = 8.83; p<0.001)	Pre-post statistically significant gains (t = 7.68; p<0.001)	Pre-post statistically significant gains (t = 5.24; p<0.001)
2 *(Value and use scientific and traditional knowledge)*	No data available	Pre-post statistically significant gains (t = 15.35; p<0.001)	Pre-post statistically significant gains (t = 11.07; p<0.001)
3 *(Encourage science and health careers)*	Of the 21 students who changed career goals from pre- to post-assessment, 64% changed to science	Of the 26 students who changed career goals from pre- to post-assessment, 33% changed to science	Of the 18 students who changed career goals from pre- to post-assessment, 33% changed to science

Teacher Data

Teachers' Rating	*Elementary*	*Middle*	*High School*
Easy to use/Very easy to use	95%	96%	89%
More engaging than similar curricula	95%	95%	77%
Strong/Very strong Native American content	100%	100%	82%

Teachers found that the curriculum was easy to use, was more engaging than similar curricula, and had strong indigenous cultural content. Overall, the data show that the DETS curriculum was effective for its three goals. Strong achievement gains were found across all three grade bands. Eagle Book supplements for the elementary-level units were well received by students, and teachers rated them highly relevant to curriculum content. In a pre-post career-choice analysis, there was some movement toward careers in science and the health professions. (For a more detailed discussion of the research findings, see Dodge Francis et al. 2009.)

Although these data summarize only results of the implementation tests, the short-term and long-term effects of this curriculum will be reflected in the improvement in the health of participating youth and communities, which we hope to evaluate in long term studies in local regions.

Qualitative Outcomes Assessment

In addition to their quantitative ratings, teachers and students who participated in the curriculum test have been generous in providing qualitative comments and reports. Teachers and students who tested the curriculum reported that the majority of students — not just American Indian/Alaska Native students — enjoyed the lessons and gained valuable knowledge about diabetes and healthy living. Data also indicated that the cultural component, vocabulary, activities and the overall content were appropriate for their grade levels.

Features teachers particularly liked include: At-a-glance and day-by-day overviews, specification of teaching standards, clear layout, and the preparation descriptions and supply list at the beginning of each unit. When asked what they liked or disliked the most about the lessons in the unit, *Being Smart about Being Healthy*, students reported that they liked doing the commercials, the celebration of community diversity, and the round dance. One student reported "I liked everything 'cause it was all so interesting and some [lessons] give you facts about it [diabetes]. I might even like science more."

Teachers said that some students who are usually disinterested in science participated actively in DETS: *Health Is Life in Balance* lessons and en-

gaged with the lesson content. The teachers thought that the active learning format and connections between the content and students' own lives captured the students' interest. Teachers appreciated the opportunity to learn more about diabetes since some of their students have been diagnosed with diabetes and many of their students have family members with the disease. Teachers who felt they lacked background knowledge in Native American culture were particularly pleased to have the cultural components integrated into the materials and to have teacher resources on Native American topics. Other unexpected outcomes include student lobbying for change in vending machine selections at schools and the positive effects of the curriculum in students' families.

The DETS curriculum is designed for flexibility. For example, teachers creatively adapted the celebration feast for their school contexts. Using the lesson to involve students in deciding how to make a regular school event — a Halloween party, for example — healthier, was a popular option. Alternatively, teachers had each group of students plan a weekly healthy classroom snack or had the students plan an after-school or community event.

One teacher's comment sums up the outcomes:

> The students are definitely more aware of their food and activity choices. They understand that the choices they make today will affect the rest of their lives. It has been time well spent and may improve the future health of some of our students.

According to these teachers, active science learning can counteract advertising tricks.

By empowering students to resist commercial messages as well as teaching them the facts of diabetes and diabetes prevention, educators direct their students toward a path of healthy, balanced living and away from the diabetes journey.

Summary

The DETS: *Health Is Life in Balance* curriculum is a K–12 sequence of science-based, inquiry format lesson units that teach about diabetes and the healthy lifestyles that can prevent or delay type 2 diabetes. In a sample unit from the curriculum, students analyze food advertisements, compare the advertising claims to nutrition facts from food labels, and create their own counter-advertisement, learning about the science of nutrition while they practice

argumentation skills. The curriculum provided significant knowledge gains in prepublication testing and is available to teachers and health educators now at no cost. Print materials can be ordered, or educators worldwide can download the entire curriculum and supporting materials from the web.

Production of the Diabetes Education in Tribal Schools: *Health Is Life in Balance* curriculum is funded by:

- National Institute of Diabetes and Digestive and Kidney Diseases/NIH;
- Centers for Disease Control and Prevention (CDC) Native Diabetes Wellness Program;
- Indian Health Service (IHS) Division of Diabetes Treatment and Prevention;
- Office of Science Education/NIH; and
- Tribal Colleges and Universities partnership.

Resources

Health is Life in Balance curriculum is now available on the IHS online catalog: http://www.ihs.gov/MedicalPrograms/Diabetes/index.cfm?module=toolsCurriculaDETS

Eagle Books: For more information and to order free copies, please visit: http://www.cdc.gov/diabetes/pubs/eagle.htm

NIH website about the curriculum and an overview of the units for each grade level. http://dets.niddk.nih.gov

Viewable Downloadable K-12 Curriculum and Copymasters http://www.kbocc.org/dets.htm

Centers for Disease Control and Prevention Healthy Youth Website http://www.cdc.gov/healthyyouth/obesity/index.htm

Teaching Tools Foster Science and Diabetes Education http://www.indiancountrytoday.com/living/health/34886734.html

Health Is Life in Balance: A K-12 Inquiry Based Curriculum Celebrating Scientific Knowledge and Traditional Wisdom http://www.msta-mich.org/index.php/publications/journalArticle/209

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