Using Mathematics to Understand the Health Issues
of the Mexican-American Community

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INTRODUCTION

The subject of mathematics has always been dreaded, if not hated, by students. Mathematics is sometimes referred to as a "dead science," that is, a body of knowledge whose sole place is in the four confining walls of a classroom. Sad to say, mathematics is invariably the bane of a school's statistical accountability. The common opinion is that it thrives only in the minds of a select group exclusively blessed with the propensity for grasping it and indulging in it. Students would often complain about its perceived uselessness. "Why study math when you don't use much of it in the real world?" they would exclaim in resistance.

And so it is that the terms that disappear and show up in the process of balancing equations are seen as repugnantly mysterious ancient Egyptian hieroglyphic characters springing from the walls of a dead pharaoh's pyramid tomb. And the teacher's voice, yes the voice, as she talks about polynomial expressions or a variety of nonlinear functions, is nothing but undecipherable Morse codes coming from the depths of the ocean, from a World War II submarine, where the technician is communicating with allies.

This curriculum unit attempts to present mathematics to 11th grade students in a practical, identifiable way, in order to reduce the fear of numbers. Most people do not realize that mathematics is very much a part of their everyday lives. Think about a baseball game without statistics. What makes avid fans shriek either in anticipated victory, or resurrected hope, or excruciating despair, is the fact that their favorite player's every move, or the dynamic orchestration of their favorite team's play during the crucial moments of the game, is fiercely punctuated by scores, batting averages, earned run averages, and so forth.

A good sense of mathematics pervades the familiar, almost routine, activities of ordinary people. Mathematical figures give us a sense of how inclement the weather could possibly be in the next few hours or days. Mathematics facilitates our marketing even when computing machines do the great job for us. We still have to "figure out" how to stretch the budget, or how to make decisions about purchases and consumption. The laborer makes a good intuitive estimation on the job. It might cost him or her job if he or she miscalculates.

These are examples of what I call gut-level common-sense mathematics, and because the situations mentioned are so informal and embedded in our everyday thinking, we do not acknowledge the figuring out as being in the realm of mathematics.

Yet, there is also the more formal sense of mathematics in our everyday life that informs and influences us in a variety of decision-making processes. The opinion polls and approval ratings that bombard the media during election campaigns render us a sense of our own opinion. Those who engage in stocks have to learn the ropes even when they have the finance analyst or broker to guide them in this endeavor. We do not simply leave our lives to the expert.

I have always liked mathematics, even as a child. I was not a nerd, although I was a shy and homebound child. I was not the kind of kid who sat for hours before a wall counting the

thousands of ants parading in an amazingly orderly linear pattern, as if saying they go about their business with a higher sense of organization than humans. I played and ran with my skinny limbs, and things in nature and at play nurtured this love for mathematics in an intuitive way. And when my limbs became brittle and plump with the passing of the years, mathematics revealed its beauty and dynamism in the more thought-provoking aspects of life. As I got older, I appreciated mathematics even more because it came to life in things that appealed to my senses and to my heart. As a social worker before becoming a teacher, I did have to rely on statistical data to guide a program. As a graduate student of education in my native country, the Philippines, even a qualitative research framework needed to be backed by the sophistication of statistical presentation and analysis, in order to earn legitimacy. Triangulation (not strangulation), is what the world of research would call it, or the marriage of qualitative approaches and "objective methods," including statistical tools.

Educational research has shown that skills and knowledge are better learned when seen in their real-world contexts. Knowledge seen as being a part of a meaningful whole is knowledge gained and retained. And so, to answer the persistent question of students "What use is there for math in the real world?" I am preparing a curriculum that would integrate mathematics, the subject that I teach, with a real-world situation that affects them as members of their community.

That real-world situation that will enhance understanding and awaken a passion for mathematics in my students will be the state of health in the Mexican-American community of Sam Houston High School.

ACADEMIC SETTING

Sam Houston High School is classified as a Title 1 School with 88 % of its student population on free or reduced lunches. As of the 2003-2004 school profile, the student population breaks down into 90% Hispanic, 7 % African-American, and 3 % white and less than 1% Asian. In terms of Limited English Proficiency (LEP) status, 21 % are LEP funded, but a sizeable chunk of the Hispanic population was originally LEP-funded so that a portion of them continue to be monitored. A small percentage of the Hispanic population did not qualify in the evaluation for limited English proficiency, indicating that they have a good grasp of the language. I am including this LEP profile because language is considered as one of the indicators of cultural assimilation. In turn, cultural assimilation is one of the factors affecting health in the form of lifestyle, decision-making in health matters, beliefs and practices (Karas 2).

The ethnic classification "Hispanic" in this curriculum context is much narrower than the government definition. Whereas in government data, Hispanics include people originating from one of twenty-one countries spanning across North, Central and South America, Hispanics for this curriculum means the predominant students who are one of three subgroups: direct migrants from Mexico, children born of Mexican immigrant parents, or latter-generation Mexicans.

In 2002, Sam Houston High School reorganized into nine small learning communities, each one carrying a career theme. My community came to be called the Health and Human Services Academy. The academy's population is approximately 350 students.

The thematic courses on health and human services nurture students' interest in and perspective towards related professions. This theme has been the initial and overriding impetus throughout the development of my curriculum unit.

As of the last stage of this curriculum writing, plans had been announced about a reversion to the bigger original school-wide organization of the student population, after three years of implementation of the small learning communities. Even in the context of this reversal, health will still be around as an elective for students who are driven towards a career in the area. Health

will still be an important and critical issue in the lives of minority groups like the Mexican Americans. Therefore, it will be a relevant topic for the application of mathematics.

This curriculum will aim to fulfill an academic objective toward student learning in a specific mathematical skill – statistical presentation and analysis. But going beyond this cold and objective level of mathematics is the ultimate objective of this curriculum unit. Students' interest in the health profession will be the heart of this curriculum. It will get students acquainted with the health profile of their community. They will be refining some research skills, searching for secondary sources from the Internet, or from agencies that could furnish them information. On the other hand, they will get the chance to seek primary data from the very community whose profile they are creating. In so doing, they are challenged to become critical and sensitive thinkers. In seeking out factors affecting health and understanding issues in their community, they will also be exposed to sound methods of inquiry. Before they set out to gather data from the community, they will plan what sort of questions will bring out the kind of data that will make up this profile. They will get prepared to test their own understanding of research questions and answers being sought. In other words, this is an exposure for them to the real world of doing things, some formally and some informally, but always with a lot of thoughtful processing.

As future health or human services workers who will serve their own community, they will also be given the chance to develop a work ethic in this curriculum. The lessons – discussions and role-playing in the interview process – will seek to acknowledge, affirm and respect people's beliefs and views. They will be introduced to the process of reflective thinking, and hopefully this thinking will be carried to an ethic of reflection about the conduct of one's profession. The discussions that I foresee to be taking place would revolve around the need for making health programs not only accessible logistically, but also realizable and reachable psychologically and culturally for its intended beneficiaries. Research shows that health care workers from the same ethnic group as the clientele hold a profound impact on the success of health care delivery. Not only do they break the language barrier. The very things that patients or clients talk about during visits to a health center or institution can at times be profoundly personal and cultural. They cannot be absolutely comprehensible when shared with a health worker outside their ethnic group. A health worker of the same ethnicity would see narratives like this as close to home.

Although the use of mathematics in this curriculum still involves serious and disciplined work on statistical data, students get to realize its power and importance in information-seeking and assessment of programs that affect their lives.

UNIT BACKGROUND

An initial look at Mexican American health issues

Physical Indicators of a Declining State of Health

There is a wealth of pre-collected data on health issues pertaining to Mexican Americans. They lend support to the interplay of socio-cultural and historical factors. For example, the very context of migration to the United States and the subsequent acculturation to an advanced capitalist system among the Mexicans creates health risk factors and barriers to availing of an American public health care system. The majority of Mexican immigrants and their succeeding generations have been experiencing "downward assimilation" with their continuing economic struggle in the First World. Gonzalez reports that Mexican Americans have some of the lowest incomes of all ethnic groups, and their poverty rates are among the highest of all ethnic groups in the United States (128). The feeling of lack of self-efficacy and failure over the course of this struggle lends them vulnerable to dysfunctional behaviors like alcoholism and drug abuse that pose risks to their health. The inability to attain economic stability and improvement of their

lives also creates unhealthy consumption patterns that mask this downward trend (David Flores 11).

Statistics show that first-generation Mexican immigrants enjoy better health and lead a healthier lifestyle than their US-born Mexican American children (Popkin and Udry). Speaking in our group's seminar on March 8, 2005, Dr. Patsy Rubio Cano of the Women's and Children's Health Care, confirms this claim further by sharing her observation that Hispanic immigrant women who may have never seen a doctor during their pregnancy give birth to perfectly healthy babies, whereas second- and third-generation Hispanics are less healthy with childbearing. Indeed, Mexican-American women undergo dietary changes that are less favorable to their health than their Mexican-born counterparts (Karas 4).

Dr. Hoelscher's talk on February 8, 2005 also made interesting mention of high school students from low social economic status in South Texas exhibiting extreme cases of obesity and underweight. Across cultures and ethnicities in the United States, Mexican Americans, along with African Americans, outscore the White population in the incidence of obesity, known to be a health status indicator, a comparative profile that seems to support the idea that the economically disadvantaged are also at risk health-wise.

Culture, Acculturation and the Mexican American's Mental Health

In the aspect of mental health, a study of a representative sample of multiple generations of Mexican Americans indicated that later generations, in this case, third through fifth generations of Mexican Americans, suffered mental illnesses that had to do with cultural ambivalence (Martinez 30). This psychological conflict is most felt as identity crisis during adolescence. Adolescents may despise ethnic beliefs and the traditional scheme of things. They may resist the traditional role expectations in the home. They may be ambivalent about, if not resent, certain responsibilities and roles imposed upon them at home, such as the need to help out financially in the family, even at the expense of their schooling. In school, they get exposed to democratic ideals, a sense of freedom that would make their first-generation parents resent that American education has made foreigners out of their children (Martinez 14). Yet, this new sense of freedom is not actualized as the emergence of a better person. They look at themselves and feel that what they are is still at variance with the dominant standards. For instance, they may not be as fluent in Spanish as their immigrant or first-generation counterparts, or may in fact reject the use of the Hispanic language, but their physical attributes give them the undeniable mark of their ethnic roots. Yet, being not quite in the dominant culture makes them also feel discriminated and isolated.

As teenagers resist ethnic tradition and feel inadequate and isolated from the dominant culture, they feel depressed, angry, and susceptible to risk-taking behaviors. According to some studies, Mexican Americans tend to display such emotional problems as juvenile delinquency, alcoholism, drug abuse, suicide and riot-related problems (Casas & Keefe 7; Clark 69-71).

On the other hand, those from the first and second generations showed illnesses arising from clinging to their ethnic values in a First World Anglo dominated society. For instance, the virility and superiority of the Mexican male is challenged by a dominant culture that tends to be more liberating of women. As the head of his family, he reels from a constant struggle to earn a living, his persistent failure in which emasculates his macho ego. He would then repress a feeling of inadequacy by resorting to defense mechanisms that create health risks to himself and to his loved ones. Depression, domestic violence, and alcoholism are some of these psychological illnesses (Flores and Carey 35).

The State of the Health Care Delivery System:
Why Jose and Maria Do Not Often Go to the Health Clinic

Everyone, regardless of ethnicity, experiences the declining state of health care delivery system in the United States, as can be gleaned from a growing percentage of the population not having access to health care insurance.

There are specific factors, however, that make the health care delivery system even less accessible to the Mexican-American minority group.

Ingrained in the culture of Mexican Americans is their faith in *curanderismo*, or indigenous faith healing. Claudia Hughes, a seminar participant, shared an eye-opening discovery in our discussion board on *webct* on February 27, 2005. She wrote that 26 out of the 27 children in her former fourth grade class claimed to have had experiences with *curanderas*. Three of them have grandmothers who are witches, and two believe that they have power to heal.

The *curandera* is always a woman who believes and is believed by her people, to be endowed with the magical and spiritual power to heal. She cures with the guidance of a particular saint, the Virgin Mary or Christ, or a combination of them. The healing ritual consists not only of invocation of her saint but also of the use of herbs and scents. She bears one of three titles. The *curandera total* is knowledgeable about the various specialties of indigenous healing, but she is mainly known for her religious invocation and rituals in the healing procedure. The *partera* is the indigenous midwife who is the community's expert in not only delivering mothers but in giving prenatal care. The *sobardora* is the massage therapist of the community.

The *curandera*'s diagnoses of various physical ailments sum up Mexican indigenous beliefs regarding health. Some illnesses are caused by the imbalance between hot and cold elements in the body, or the dislocation of an organ. Others are brought about as God's *castigos* or punishment for sins or the lack of spiritual good in an individual, a family or a community. The more psychosomatic illnesses are believed to be more of magical origin. Examples are *susto*, or magical fright caused by a "dislocation of the soul, or *mal ojo*, or evil eye, inflicted by someone with a stronger make-up that his/her glance can make a weaker person, usually a baby or child, fall ill (Rose 18-24).

The *curandera* is well respected in a community that is deeply religious and that recognizes her as God's mediatrix in their earthly affairs. She is the one sought for good counsel, not only in times of physical afflictions but also more importantly during family and personal crises. She knows her people, as they know her. She goes to their homes and takes her place as part of the family. Yet, unlike the mother or daughter in the household, who is expected to be submissive and subservient, hers is an awe-inspiring presence. She has transcended the inferior place accorded to women by a macho Hispanic culture. She is esteemed and loved, and her healing so effectively accepted that even action researchers concede that policy makers and health program planners should learn from her very personal and loving approach to healing.

One recommendation is that health care givers come from the same ethnic background as the recipients of health care. Knowledge of and sensitivity to the nuances of language and cultural experience will make healing procedures more acceptable and therefore successful. When patients feel understood very much like a *curandera* understands them, then this faith in the healer has the same placebo effect as the treatments in the American Medical Association's experiments on healing efficacy (Perrone et al. 96-97).

This need for cultural sensitivity is even most important in the delivery of mental health care. Hispanic patients availing of mental health services complain of being misunderstood, and admit to not disclosing many of their innermost thoughts during counseling sessions. They feel that if they talk to their doctor (who was invariably an Anglo American) about *mal ojo* or *susto*, they

would be ridiculed or met with a blank stare. They also admit to going to the *curandera* even while under the treatment of a mental health physician!

Cultural sensitivity is not only a health practitioner's philosophy of tolerance and acceptance of his clientele's cultural world. It is a tool for obtaining a database for and employing a communication approach at health education. As the information on health issues above suggests, not everything in a people's culture is pleasant, and in the context of this curriculum, health-enhancing.

Richard Garcia, himself a physician of Mexican descent, shares his experiences in the practice of his profession when dealing with patients of his own ethnicity. He acknowledges the importance of cultural sensitivity. However, he notes that a health practitioner should also be keenly aware of persistent beliefs that stand detrimental to health. For instance, he narrates how he patiently dealt with this delicate issue of making parents realize that feeding large amounts of food to children and being fat are not at all indicators of a healthy practice or a healthy body, as they are raised to believe (215-219).

A Framework of Looking at Community Health Issues

My interest in community health issues dates all the way back to the time before the start of my teaching career. Back in my home country, the Philippines, I worked with a non-government organization serving the primary and reproductive health needs of women from impoverished urban communities. Pre-existing statistical data and information on the health status of the sector we served initially guided our planning and distribution of resources. But a significant aspect of this non-government health care program is health education.   Sensitivity workshops and community organizing among the grassroots women we served provided the sponsoring organization the information and framework for education on health care as well as for the delivery of the health services themselves. Thus, government health agencies, or any well-meaning sponsoring organization, for that matter, do not simply trickle down their resources. The recipients of these resources should be heard, and their personal and community circumstances acknowledged, respected and considered in the formulation of policy and the manner of health delivery. The primary data-gathering part of this curriculum unit will be an initial effort of undertaking this culturally sensitive framework.

CURRICULUM IMPLEMENTATION

Alignment with Texas Education Standards and the Larger Curriculum Context

The potential groups of students who will be undertaking this curriculum will be my 11th grade Algebra 2 classes next year. My students in these classes will be handling details of the statistical health profile from secondary sources published by agencies in Harris County, the Houston area and across the nation itself. The Internet is also a rich source of fresh data.

With Hispanics being the predominant population at the Sam Houston High School community, students will focus on creating a health profile of this minority sector. While focus group discussions will precede and guide the conduct of data gathering from secondary sources, the following tentative questions will ultimately form the meat of this statistic-driven research:

1. What are the causes of morbidity and mortality among Mexican Americans?
2. Given that obesity, drug abuse and HIV infection are health issues of the day, how does Mexican American health status fare in these areas?
3. How do the Mexican Americans compare with other minority groups in the United States in terms of specific health indicators? What do research findings suggest as factors influencing these differences in specific aspects of health?

4. Within the Mexican American population itself, is there any significant differentiation among generations, including the first-generation Mexican immigrants, in terms of lifestyle affecting health and specific indicators of health status?

As of this writing, there is a proposal to include AP Statistics as an elective in Sam Houston High School. I am offering this curriculum to a colleague who will be assigned to teach this subject as a potential material for teaching concepts in statistics. This curriculum may then be expanded to include the more sophisticated statistical tools for analyzing data.

Data presented statistically provide the material for students' engagement in the mathematical exercise. They will be made aware of variables that go into trends and graphs. They will discuss the implications of tables, bar graphs, histograms and distributions of responses or incidence of a particular phenomenon, situation or characteristic. They will be asked to identify variables that go into patterns and relationships. They may stretch the data available by recreating relationships and patterns, as when they combine variables and sets of data in order to see their relationships in a new light.

Understandably, my students cannot skip or go beyond the objectives spelled out in the literature on Texas Education standards. But as fledgling social researchers and scientists who do this exercise because of a potential future commitment to a health profession, they will be challenged to scrutinize statistical information. Without the sophistication and rigor of graduate research measurement, of course, they would be introduced to various concepts of data handling and analysis. For instance, they will confront the meaning of correlation of variables and how this is determined statistically. They will be initially acquainted with the concept of level of significance, its mathematical convention, and how it is used as a tool to reject or accept an initial assumption or hypothesis about the research topic.

The mathematics curriculum in 11th grade welcomes and makes possible the integration and alignment of this curriculum unit. I am planning to incorporate the unit as a project for the first quarter topic of the course – Foundations for Functions. The connection and integration will be even more significant if this regular curriculum topic is covered alongside Objectives 9 and 10 of the Texas Assessment of Knowledge and Skills or TAKS. These objectives, as well as the specified prescriptions from the Texas Essential Knowledge and Skills, are described below.

The Houston Independent School District has a pool of curriculum specialists who draft entire curriculum units for courses, in a guidebook entitled Project CLEAR, in order to ensure alignment of these courses with educational principles and state-mandated curriculum objectives. It is the format of Project CLEAR-based instruction to combine reviews on the TAKS Objectives with regular lessons. Incidentally, Objectives 9 and 10 are two of the student expectations in which they performed most poorly in last year's TAKS. And so this curriculum unit will replace days of drill-oriented review on the objectives with a more profoundly meaningful application of the mathematics skill being taught.

The Curriculum Context

The unit "Foundations for Functions" in the Algebra 2 curriculum reinforces students' understanding of functional relationships among variables in a variety of real-world situations. In this functional relationship, the independent variable influences, determines, or causes the outcome of the dependent variable. The term variables, essentially means the same as factors when we talk about things that are related to each other in some way. As a simple example, the amount of calories in the food a person consumes directly determines the weight he gains. So the amount of food intake or the calories contained therein is the independent variable, while weight gained is the dependent variable. One may intuitively also offer to assume the existence of a

functional relationship between the number of hours spent on physical activity and cardiovascular condition.

When information warrants the comparison of quantifiable variables such as the examples given above, in the specific research on health profile of the Mexican American community, students may be challenged to create scatterplots and suggest a reasonable relationship between the variables these quantities represent. Perhaps, the variable socio-economic status may compare wages against the incidence (meaning, number of cases of illnesses), as a concrete example, so that when students plot points matching up quantities for these variables, students may suggest and critique their ideas. Students may then conclude if the sets of data or the variables they represent demonstrate a positive correlation, negative correlation or no correlation at all. This is the foundation for statistical analysis of research data.

In this unit, the idea of relationship among variables is not confined to mutually quantifiable factors. Nominal or ordinal variables or classifications, such as a Mexican Americans' generation order (immigrant, second generation, third generation, etc.) may be compared against the incidence of specific health indicators such as obesity, diabetes, heart ailments, and so on. Or one may speak of one's geographical location or ethnicity as the independent variable influencing a measured or identified existence of a health indicator. Stretching the concept a little further, the variable acculturation measured by some tool may be compared against the incidence of mental health issues such as alcoholism, domestic violence, drug addiction, gang involvement and juvenile delinquency, etc. Even the incidence of such health practice as going to the *curandera* or indigenous healer may be considered as a health variable that may be dependent on language competency and acculturation. Students are encouraged to analyze relating sets of factors based on the available secondary data they will have at their disposal.

The mathematical means of determining the presence and nature of relationships can be exciting when understood. But it is the analysis, critical evaluation, and synthesis of these mathematical tools with interplaying factors in a social issue of study, such as health, that give them their human and real-life significance.

The entire six weeks on the unit "Foundations for Functions" cover other attributes and properties of functions. The relationships among variables defined and described above are analyzed from their tables and graphs. A lot of literacy skill also goes into the study of this basic concept on function, since verbal descriptions are an important means of communicating and clarifying understanding. A lot of critical analysis of relationships among quantities and factors goes into the focus group discussion and journal writing that accompany the preparation and organization of statistical data from secondary sources. Then again, at the conclusion of the data-gathering from primary sources, the women respondents in the interview surveys, collation entails a clear understanding of the variables, quantifiable or not, that relate to each other in the organization of health profile.

The latter part of the bigger CLEAR curriculum unit introduces specific functions and their graphs – linear and non-linear functions. Here, transformations are tackled as a general property possessed by families or types of functions. This is no longer the scope of the special research project on health. But the project will hopefully enable the students to raise their understanding of functions in a profound and relevant way.

The first and second of the objectives in the Texas Assessment of Knowledge and Skills (TAKS) addressing understanding of the foundations of functions integrate well with the ninth objective on descriptive statistics, which this special project also fulfills.

This special project under the Algebra II curriculum unit addresses the following TEKS Math objectives:

A(b)1B.   Use data sets to determine functional relationships between quantities.
A(b)1C.   Describe functional relationships for given problem situations (and write equations or inequalities to answer questions arising from the situations – this part is not the scope of the curriculum unit).
A(b)1D.   Represent relationships among quantities using models, tables, **graphs**, diagrams, **verbal descriptions**, equations and inequalities.
A(b)1E.   Interpret and make inferences from functional relationships.
A(b)2C.   Interpret situations in terms of given graphs or create situations that fit given graphs.
A(b)2D.   In solving problems, make and interpret scatterplots, and **make decisions and critical judgments.**
8.12A.   Select the appropriate measure of central tendency to describe a set of data for a particular purpose.
8.12C.   Construct circle graphs, bar graphs, and histograms.
8.12B.   Draw conclusions and make predictions by analyzing trends in scatterplots.
8.13A.   Evaluate methods of **sampling** to determine validity of an inference made from a set of data.
8.14A.   Identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics.
8.14D.   Select tools such as real objects, manipulatives, **paper/pencil, and technology or techniques** such as mental math, estimation, and number sense to solve problems.
8.15A.   Communicate mathematical ideas using **language, efficient tools, appropriate units, and graphical, numerical**, physical or algebraic mathematical models.
8.15B.   Evaluate the effectiveness of different representations to communicate ideas.
8.16A.   Make conjectures from patterns or sets of examples and non-examples.

*Note: The words and phrases in bold letters indicate the relevant activities in this curriculum unit that fulfill the objectives.

On the other hand, the following are the three TAKS objectives to be addressed in this unit:

Objective 1:   The student will describe functional relationships in a variety of ways.
Objective 9:   The student will demonstrate an understanding of **percents,** proportional relationships, probability, **and statistics in application problems.**
Objective 10:   The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

Raising Questions from Answers

The statistical data from secondary sources furnished from agencies or culled from literature at the Internet form part of the answers to researches conducted by experts in their fields.

The data, after being scrutinized mathematically, will not be accepted as final answers and looked at as an inert body of information. The information will trigger more questions and give birth to related issues for inquiry.

If the data gathered support the ideas and assumptions discussed above, the following questions may arise in the course of students' focus discussions. What do research findings imply in the context of Sam Houston's school community? If the Limited English Proficiency status and labels could predict the level of a person's assimilation, then majority of the school population may be classified as first generation immigrants, and that segment that are born in the U. S. as second or third generation Mexican Americans. Based on the research literature, would we expect to see higher incidence of risk factors and less healthy lifestyle in the second population?

Yet, would we also expect an unhealthy coexistence, if not persistent clash, of health beliefs and practices within the home? Such a clash or coexistence of extremely diverse values occurs because immigrant parents are ethnically grounded while their children, who either migrated with them to or were born in the U. S., go to an American public high school.

The preceding discussion addressed the issues of obesity, eating habits, mental health-related problems, and health care delivery. How vulnerable are Mexican American teenagers to drug abuse and other health problems? The talk by Dr. Haile, Assistant Professor at the College of Nursing of the Texas Women's University, stressed the fact that there is a growing incidence of AIDS infection among Mexican Americans. Is this trend part of the risk-taking behavior arising from negative acculturation? How would students perceive the level of drug abuse problem within their community? Would there be a higher incidence of drug abuse among the later generation Mexican Americans than among their immigrant counterparts? What about AIDS and teenage pregnancy? What are the factors that expose Mexican Americans to these health risks? What is the level of awareness of parents on these issues?

Focus group discussions, open class discussions, and reflection journals will surface the questions triggered by the bulk of data presented from secondary sources. The reflective discussions will reveal students' own level of awareness and construction of meaning from issues confronting them. The questions may further prompt them to formulate research questions or items of inquiry for the data gathering they are about to undertake in the second part of this unit. Students will move on to validate some assumptions.

Voices from the Grassroots

As mentioned earlier, this curriculum will provide students with the opportunity to engage in primary data gathering. Such a curriculum is inspired by the framework of initial readings that place importance on cultural sensitivity. Cultural sensitivity is the framework of delivering health care with an understanding of the recipient community, ethnic and subgroup belief system, values and perceptions relating to health care and seeking. It is the common thread that runs through the works of Casas and Keefe (1978), de la Torre and Estrada (2001), Flores and Carey (2000), and Martinez (1978).

The group discussions in class before and after the statistical organization of data will tackle issues of perception and belief among Mexican American adolescents. In addition, the primary data gathering will focus on married women in the households from which the students come. Married women are chosen because understandably they are the ones who have the role of seeking health care for themselves during pregnancy and in connection with their nurturing of children. The following questions are tentative items that may provide insight into beliefs, practices and perceptions, these elements being in the realm of the issue of cultural sensitivity:

1. What is your ethnicity? (A question on perception of one's ethnicity).
2. When was the last time you have seen a doctor? Why? (Unraveling factors, beliefs, for health-seeking decisions)
3. What is the ethnicity and gender of the doctor who treated you?
4. How did the doctor treat you?

These questions may guide students' conduct of interviews with the target respondents described above, or may form the spirit of a questionnaire that will be developed as students go through the preparatory phases of the data gathering.

Students will be introduced into the task of coding answers so that the data can be collated and organized statistically. Ultimately, the entire exercise will raise students' awareness on the health status of their community and strengthen their commitment to pursue the path to provide health care to their own people as a profession.

Paradigms, Approaches to Data Gathering: The Controversy in Social Research

The use of statistical tools to seek out information on health issues indicates that the scientific method guides the conduct of this social investigation. During brainstorming focus group discussions, the teacher will stress the need for students to standardize their manner of throwing information-seeking questions at their respondents, and to mean the same thing when they ask these questions. It is important to remember that informants' possible answers will prompt students to attempt to measure people's perceptions, beliefs and attitudes!

Recent paradigms or frameworks are challenging the soundness of the scientific, sometimes called logical-positivist, approach to data gathering. For one, people's views, sentiments and innermost thoughts as they are stated before a researcher are always pregnant with the unique and dynamic meaning of their personal and social circumstances. Their thoughts, therefore, cannot possibly be captured by a standardized structured set of questions. Secondly, according to critics of the scientific method, mulling over random sampling as an important area to check for bias is not the area for insightful study.   Random sampling, the advocates of ethnographic research, for instance, assert, is not the all-powerful tool of sound research. One may opt to study a small group of people living in a secluded place and still obtain insight that may represent a wider circle of people, if qualitative methods ensure in-depth probing into their way of life, their spontaneous everyday discourses, and dealings with each other and outside of themselves, and their life stories as they narrate them.

I am awed by the depth and substance of a recent study conducted by Anna de Fina on fourteen immigrants who lived together in four households in Langley, Maryland. She studied the way they told their narratives about significant events in their lives as immigrants in the United States. One such event was crossing the border. The narratives revealed the informants' tendency to shift their first person *yo* account to the collective third person *nosotros* or we, and to submit agency of actions in their accounts to the powerful (like authorities) who confront them and the collective mass of people from whom they draw on support. The study shared the following insights: a) that Mexican Americans have deep mistrust of others outside their immigrant experience; b) that they have strong ties with and clear dependence on "collective support and social interconnection"; and, c) that they have strong family and kinship ties (De Fina 36-37, 89-92, 138, 224).

These are good and helpful insights as well that can shed light on why health care delivery system for Mexican Americans needs considerable improvement.

Rather than diminishing and downgrading the importance of statistical information, I am integrating these narrative approaches because they give more substance to the data that can otherwise be obtained from a survey. In addition, the narrative analysis technique can be a helpful tool for processing data with the students during focus group discussions. I will not be a distant participant observer during these discussions. I will verify my understanding of things they bring back to me from their survey. Aside from the survey, I will encourage them to pursue conversations with the informants, who may be their family members, friends or neighbors. I will ask them to possess the same sensitivity for nuances as I will strive to exemplify during the focus group discussions. I will remind them to document the insightful messages they gain from these conversations or from the observations they shall be making in the process of interaction with informants.

I foresee that the statistical collation and analysis will provide important information on the extent or incidence of certain health problems, practices, beliefs and perceptions. Knowing that a certain percentage of a fairly representative sample confront a particular health problem, or hold a particular view of health care and decision-making, is the most significant service that statistical method can possibly render. It is in this sense that I would like to awaken the appreciation and

passion for mathematics. The discussions arising from the statistical findings will, in turn, plant the seed of sensitivity, cultural competence and commitment for a potential career in the health profession.

Timetable for Data Collection, Analysis and Presentation

The curriculum unit will cover six weeks of implementation. Throughout this entire unit, focus group discussions will intersperse with data gathering and statistical collation. As a project for the wider unit on Foundations for Functions, the discussions will be the occasional lesson for the day between periods of regular instruction on the other topics of the over-all unit. As explained earlier, classes will still have to cover specific types of functions not within the scope of this project.

Here is a suggested repertoire of instructional activities in this special project:

1. Modeling choice, presentation and analysis of statistical data. The teacher will present data obtained from any of the health agencies mentioned in the early part of this narrative. The discussion, either within the whole class or within small groups, and with the help of prepared guide questions, will draw out students' understanding of the statistical elements of the data – variables involved, the quantities (raw data, percentages, units, comparative quantification, and how these have been obtained), and the trends suggested by these quantities. Here, the teacher models a critical behavior of approaching statistical data. The higher-order thinking revolves around the reasonable sampling of people and places that furnished these data. Do we have a fairly sound set of data, or do we have fairly representative sense of the true situation that the data claims to describe? What may have contaminated the data, if any? In graphs relating two quantifiable variables, does there seem to be positive or negative correlation?
2. Focus group discussion on health issues to be pursued by students. It is the students' turn to plan out the kind of statistical health information they want to seek in relation to their community's health profile.
3. Internet searching and Data-gathering from agencies. Selected students and volunteers may opt to go to agencies around Houston as secondary sources of data. Students will also extensively utilize the school's Internet resources to obtain updated statistical data on the identified aspects of community health.
4. Group Reporting. Again the same set of higher-order thinking questions modeled above is expected to comprise their group reporting in the ensuing class discussion. Panel boards, overhead projectors or enlarged graphing sheets may assist them in these presentations.
5. Sharing of Perspectives on the Issues.   This is accomplished either as part of the group reporting or by separate focus group discussions. The teacher initiates the sharing of perspectives by discussing the conclusions, analyses and explanations for the variety of health issues described by the reported statistical data. For example, she may discuss *curanderismo*, or negative acculturation, or the factors explaining the disparity in health status of immigrants and later-generation Mexican Americans.
6. Journals. Students will be asked to journal their impressions, learnings and reflective wanderings throughout the entire process of inquiry in this unit.
7. Consultations outside the regular class hours for this project will support students' activities.
8. Focus Group Discussion on primary data collection. Undoubtedly, questions will arise from the sharing of perspectives, for after all, these explanations and analyses will only be abstract assumptions, and at best, only distant empirical claims, when not validated by actual primary data. In this focus group discussion, students will propose items for a questionnaire or structured interview as tools for gathering primary data. The four survey

questions listed above make up a sample of the kind of primary data to be sought with female respondents as the preferred sector of study.

9. Standardizing the Conduct of Interviews or Survey - To ensure that there is a common understanding of the data being sought and of the questions to be asked to obtain these data, a class meeting will verify the significance of every item. A female custodian or a parent may be invited over to be a respondent in a mock interview or survey answering session.

10. Class Interview with a *Curandera* or Indigenous Healer. This class session/interview will deepen students' exposure to their own cultural root by getting acquainted with the influence of a central cultural figure on their families' health practices. She may already be a familiar sight in their community in the first place, or may be somebody outside it, but one who owns a welcoming haven somewhere in Houston for community members seeking cure for their ailments. Again, this session in a mathematics class, may not directly be TAKS directed but will undoubtedly put across the message of the great respect accorded to the social context of any statistical research.

11. Data Collation - Data will be collated within groups, within classes participating classes and finally, shared across participating classes. Copies of the total collation will go back to the groups to be organized, summarized and presented statistically. Students will then make conclusions from these results, or offer their own analyses.

12. Creative Student Product – As a culminating activity for this unit, groups of students may create posters that summarize the findings in the form of slogan or a call. This call may be addressed to fellow students in the community, to concerned health agencies, to their own broader ethnic community.

EVALUATION AND ASSESSMENT

As explained earlier, this curriculum unit seeks to fulfill learning objectives for specific mathematics skills as well as for enhancing the career theme around health and human services. Therefore, any evaluation tool and method shall seek to measure student progress in two areas: first, the ability to collate, interpret and analyze statistical data from both primary and secondary sources; and second, insightful and reflective thinking during data-gathering activities manifesting commitment and work ethic toward a potential career in health and human services.

At the outset, class time will be allotted to creating rubrics of assessing student works in these two areas. Assessment is essentially both process and product. Therefore, students' progress is gauged even during brainstorming sessions, while groups are working to collate data, or are discussing key issues that surface at critical moments during the primary data gathering. These activities may very well serve as performance assessment tools. A feature of the rubrics created at different phases is the assessment of these performance skills. For instance, part of the rubric will assess whether groups ensured participation by individual members for the accomplishment of a group task; whether they manifested sensitivity, caution and reflective thinking in the conduct of their primary data gathering; whether they performed the proper steps in the collation and presentation of data. Finally, the following student products will be formally evaluated against these rubrics:

1. Presentation and reporting of statistical information gathered from secondary sources. The final product consists of graphs and diagrams or webs of ideas. Groups will also discuss their visual presentation in class. This group reporting will also furnish part of the information for assessing process and performance, as explained in the preceding paragraph.

2. Journal of activity, interaction, and insights. With guide questions, students will individually write their narratives of experiences and insights in the process of data gathering, both from primary and secondary sources. The journal will be a tool for

evaluating evidence of value learning about cultural sensitivity, reflective thinking and work ethic, as students are prompted to narrate how they handled interaction situations and sought information. Other prompts are on how students make meaning of the primary and secondary data they have collected.

3. Creative Expression of a Call to Action. Finally at the end of this project, students summarize their learnings in a creative visual form, such as a poster, that states not only a statistical fact but also a call to action that addresses a health issue among the Mexican American community. Again, a rubric will grade this product not only for visual creativity but also for correctness of collation, accuracy and adherence to the information gathered from research and depth of analysis.

SAMPLE LESSON PLANS

The project will coincide with the full coverage period for the unit on "Foundations of Functions" and will span a full grading cycle of six weeks. Lesson plans on this project will intersperse with regular lessons on the rest of the topics covered under the bigger curriculum unit. The following lesson plans cover the most crucial stages of the research project.

First Week - Day 1: Introducing the Project.

The objective of today's lesson is to reinforce students' initial understanding of the concept dependent and independent variables by way of its application in this special project. The concept is an early lesson within the bigger Algebra II curriculum unit entitled "Foundations for Functions."

In the first week, the project will be introduced through a discussion of the concept of good health. The teacher may then proceed to a statistical presentation of a specific health indicator. The teacher may discuss on the issue of teenage obesity for a start. This discussion will model the kind of data the students will subsequently look for and the kind of research-related questioning they are expected to engage in. For example, not only will the discussion inform about the incidence of obesity among Mexican-American teenagers. It will also explore the relationship, if any, between obesity and ethnicity, between obesity and geographic location of Mexican-American respondents in a survey, or between obesity and cultural assimilation. As part of the math objective for this unit, the relationship between these "variables" will be illustrated graphically or tabularly, if data are available from secondary sources. The teacher will also choose a study that exemplifies the relationship between two sets of quantitative data and discuss the statistical meaning of correlation. Scatterplots, by the way, are part of the conceptual exercises of this bigger unit on "Foundations for Functions." A media projector will be extremely useful in the presentation of these graphical and statistical data.

Then a whole-class brainstorming session will follow this modeling presentation. The purpose of this discussion is to surface other indicators of good health or the lack of it, and other aspects of health which students, who come from the very population this mini-research project seeks to explore, would want to gather information about. Here, the class as a whole raises initial research questions emanating from the general objective of knowing the health status of the Mexican American population in the United States.

With these research questions raised, a focus group discussion will then survey students' existing repertoire of information about the health status of their community. Students in these groups will then plan out specific areas of health to research on. Perhaps the preceding whole-class brainstorming will distribute specific topics for research to the groups into which the class will break for further discussion. When the assignment of topics to groups has been finalized, a class period within the same week will be allotted to searching for these data on the Internet. As supplementary materials, pre-collected data from health agencies and institutions around the

Houston area shall be given to students as homework. This homework shall contain instructions and guide questions for analyzing statistical data handouts.

Today's student group performance will be evaluated against a rubric that sets standards on cooperation, grasp of the concept of dependent and independent variables as they come into play during the focus group discussion, and elements of group planning on a project. The evaluation tools include peer and teacher observation and a draft of hypothetical statements that will initially guide the subsequent data gathering from secondary sources. The hypotheses will contain sentences of the form "_____ (the specific variable) affects the _____." "The more _____ (variable) one is, the _____ (the dependent variable) he or she is prone to become." Both the observation and the hypotheses draft shall be incorporated in the rubric for this day.

First Week - Day 2

A class period shall be allotted for students to download existing statistical data on the Internet. The teacher facilitates their search by guiding them in the creation of search strings. Groups may extend their search outside class periods, since the school library has after-school computer service. It has been agreed upon previously that each group will be focusing on a specific research question. For instance, group may opt to pursue the issue of obesity and factors related to it.

For today, a rubric will be accomplished by both teacher and peers evaluating contribution to the group and documenting completion and depth of the Internet data gathering task.

Second Week - Day 3

Today's lesson plan aims to evaluate students' understanding of the mathematical concepts covered in the bigger unit: identifying the variables that appear to have a functional relationship, statistical presentation and analysis of data and determining further mathematically the kind and degree of correlation among variables, if gathered data would allow for such an exercise. The higher-order thinking skills that go with research are also assessed, as students articulate how they make meaning of the data they are presenting.

Now, in the second week, students are ready with their presentations. Again, the media projector would be an excellent tool for visual presentation. Members of each reporting group will take turns discussing specific aspects of the data analysis. After explanations on graphs, percentage distributions, and frequencies, if any, relating to an issue on health status, particular attention will be paid to the relationship among the variables mentioned. This is the critical thinking part of the report, when the group evaluates the soundness and reliability of data. This is also an opportunity for them to extend what the statistical data suggest to their own milieu of experiences or to their own exposure to the phenomenon or incidence illustrated by the data. The group will now offer further research questions to validate from the primary data gathering.

Again, beforehand, a rubric shall have been created to assess the method and content of reporting. Individual students will also journal their reactions, reflections and insights.

Third Week - Day 4

This is the fourth full class period to be dedicated to the project. By this time, further research questions shall have been formulated from the information analyzed from the statistical data to guide students in the next stage of data gathering. This time, students will seek to validate findings by gathering data specifically from women members of their own community. Guide questions have been tentatively stated in the earlier part of this paper. These questions address issues of perception, beliefs and values surrounding the seeking, delivery and availability of health care delivery systems. During the group reporting, students may formulate a different set

of guide questions in the course of the research, depending on the theme that emerges during the data gathering.

Today's lesson aims to inculcate not only sound practices in data-gathering from primary sources, as in an interview, but will also attempt to introduce the concept of cultural competence and sensitivity as an important part of a work ethic in a potential career in health and human services.

The lesson plan for this day has been preceded by the formulation of the guide questions for primary data gathering mentioned above. On this day, the teacher will attempt to model an appropriate transaction between researcher and respondent. Not only will it model respect and sensitivity, but it will also demonstrate how conversations are directed toward obtaining, pursuing and clarifying information. Today, a woman custodian in the school is invited over to act as the respondent in a mock interview. The teacher may herself be the interviewer/researcher, but due to the language barrier, a Hispanic student may alternatively serve as the interviewer. With the guide questions already having been formulated earlier, the teacher/student conducts the interview with the custodian following these guide research questions. The teacher or student takes down notes on her interview guide sheet as interview goes on, or the moment it ends.

After this enactment, the class goes on to critique the conversation that has just transpired against a prepared rubric. The class may point out strengths that make an interview successful and informative for the purpose of the research, or it may make suggestions for improvement. The rubric may also seek to gauge whether the researcher has practiced cultural sensitivity. Was he/she rude, or respectful and accepting? Were her questions clearly understood? Did he/she attempt to pursue or clarify a point? Did he/she note down the accurate information she got from the conversation? Did he/she influence the interviewee's responses to a point that these responses are basically the interviewer's point of view? When the interviewer noted down the information he gathered from the interview, did he have a good grasp of the nuances of narratives? Did he have the right construction of meaning between things that are said and those that are hidden between the lines?

Students are then prompted to enter their individual journals on this mock interview. Such an entry should underscore insights they gained from the conduct of the interview. This insight should guide their subsequent data gathering from interviews/survey.

It should be noted that whatever observations and insights they have gained from this exercise are written in a journal, which shall be part of an over-all assessment tool.

Third Week - Day 5

Today, a *curandera* comes to class to share on her role as the indigenous community healer. Not only will she share on her rituals and beliefs. Her talk will give students an idea of the degree of influence she has on the community's health care seeking decisions. If numbers indicate the degree of this influence, then questions from students in a math class may include frequency of visits and volume of clientele. The subsequent primary data gathering exercise will seek to affirm from respondents the claim to this influence.

Again, students will journal the insights and observations they make on this interview. As part of an over-all evaluation, the journal is graded.

Fourth through Fifth Week - All Class Periods

From hereon, as primary data gathering is in progress, the first thirty to forty minutes of every class period shall be allotted to informal consultations with groups and individuals. These moments shall address any problems that may arise on the field. This is also a way for the teacher to ensure that the documentation of responses goes smoothly.

Sixth Week - Day 5

The objective of today's lesson is to code and collate qualitative responses, and to reinforce students' understanding of frequency as it relates to people's responses. This tedious exercise is part of the greater context of mathematically searching for a pattern of relationship among variables. Variables are inferred from the responses to questions as they are compared against each other or against the demographic data. For example, if working within the proposed set of questions stated earlier in this paper, students may compare frequency of visits to the *curandera* to the size of her family, her age or her generation order as immigrant. Perhaps, women's responses to their perception of the doctor's treatment of them during clinic visits may be compared against their responses to their perception of their own ethnicity.

Today, the class sits down in groups to code and collate responses from their own data-gathering. When groups shall have made categories of responses, the class then meets on how to put these categories together so that responses become meaningful. Then the groups sit down again for collation of responses. If several classes are involved in the data-gathering activity, then this categorization and coding session will take place in all these classes. The teacher will propose a final set of codes for responses across classes based on these meetings of groups in their classes.

The final set of response codes goes back to the groups in every class. They tally responses from their own fieldwork on the basis of response categories. A volunteer group will undertake the collation of all responses across all classes of data-gatherers.

Upon collation, the data are available for statistical presentation and analysis.

Sixth Week - Final Activity outside Class Periods

The participating classes may collectively create campaign material, such as a poster, which will send a message about the findings of this primary data gathering. Such a visual campaign material will include statistical or graphical illustrations of these findings. A call to action addressing the health issue that is illustrated and summarized by this graph or statistical illustration will be stated in this poster, and it shall be the expressed inspiration from this six-week long research project. The posters shall be made visible on strategic walls of the building.

This finished product is one of three major exercises that are evaluated against a rubric. The other two are the journal and the group statistical presentation during the secondary data-gathering phase of this project.

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