Academic Exchange Quarterly Fall 2018 ISSN 1096-1453 Volume 22, Issue 3
To cite, use print source rather than this on-line version which may not reflect print copy format requirements or text lay-out and pagination.

A Case Study Using Culturally Relevant Math

Cherie A. McCollough, Texas A&M University-Corpus Christi, TX
Olga M. Ramirez, University of Texas – Rio Grande Valley, Edinburgh, TX
Amanda Carranza-Alvarez, University of Texas – Rio Grande Valley, TX

Cherie A. McCollough is a Professor of Science Education at Texas A&M University-Corpus Christi. Olga M. Ramirez is Professor of Mathematics and Statistics at the University of Texas – Rio Grande Valley. Amanda Carranza-Alvarez was senior student at University of Texas – Rio Grande Valley during this project and is now a secondary mathematics teacher.

Abstract
The following case study presents a teacher candidate who conducted an authentic research experience using culturally relevant teaching in mathematics. The culturally relevant math activity (CRMA) involved four secondary Latino students and their parents learning about "diabesity"; that is, diabetes and obesity among Latinos in south Texas. A second presentation followed with future science teachers at a different university in South Texas where pre/post data was collected and interviews conducted. Results showed that the experience significantly deepened the future teacher's appreciation for culturally relevant instruction.

Introduction
STEM teacher preparation in mathematics continues be procedural and lacks integrating teaching knowledge that successfully transitions from the departmentalized model of teaching to an integrated model. Ideally, this model should promote authentic and culturally relevant subject matter (Hutchison, 2012), particularly among Latino students. While Latino students have continued to make gains in high school graduation and access to college, this cohort continues to be underrepresented in science, technology, engineering and mathematics, education areas, and STEM degree attainment (Rendón & Kanagala, 2017). The shortage of certified STEM teachers is of concern throughout the United States because of significant numbers needed over the next over the next 10 years (Hutchison, 2012). Contributing factors for the critical shortage of middle school STEM teachers, especially in low income and high minority schools include teachers' inadequate STEM content and relevance of STEM subject matter (Marx & Harris, 2006).

Literature Review
Fewer than half of elementary and secondary teachers have completed the minimum number of recommended math courses and many elementary school teachers hold significant misconceptions regarding math teaching (Capps, Crawford & Constas, 2012). The lack of focus on math and math teaching as well as the lack of preparation in math content helps explain why

math is not integrated with other content areas such as literacy or science, and why strategies that engage children in the process of inquiry are not common (Capps et al., 2012; Gillies & Nichols, 2015). Teachers are often conducting science and mathematics activities without understanding the process behind those activities (Windschitl, Thompson, Braaten, & Stroupe, 2012). What is missing in the general teacher preparation model is the investigation and exploration that is involved in authentic science and mathematics research, such as framing a valid research question, rigorous and sometimes sophisticated data collection, consistent questioning throughout the process where the activity both generates and validates knowledge that is not necessarily a step-wise, linear progression (Ingersoll & Merrill, 2011). Authentic science and mathematics can best be experienced by conducting relevant, testable, revisable, explanatory and generative research in authentic settings that include an active-learning modality (Windschitl et al., 2012). However, future teachers are rarely given the opportunity to work with scientists and mathematicians to learn how science and mathematics is conducted. Undergraduate research can provide this opportunity and research overwhelmingly supports students' positive perceptions when involved in undergraduate research. Studies report that a high percentage of students would recommend the undergraduate research experience to others, and that students perceived the most valued skills derived from the experience to be problem-solving skills and the development of professional self-confidence, self-efficacy, mathematics- and science-related career interests and that they enjoyed the close contact with faculty (Luzzo, Hasper, Albert, Bibby & Martinelli, 1999). Further, interactions with faculty that combined students' classroom and non-classroom experiences have been found to positively impact STEM student retention as well as STEM efficacy (Tsui, 2007).

In addition to incorporating authentic research experiences, future STEM teachers should also consider making their curriculum culturally relevant. Teacher candidate educational experiences must address a change in attitudes and misconceptions concerning language differences, cultural understandings of the roles of families, parents and teachers, and anxiety about parents' efficacy to help their children with schoolwork to forge effective school/parent partnerships (Ramirez, McCollough & Dias, 2016; Ramirez & McCollough, 2015; McCollough & Ramirez, 2012). Population demographics make it imperative that teacher candidates receive appropriate experiences in their teacher education programs that prepare them to encourage and develop partnerships with parents, specifically culturally and linguistic diverse parents. However, Ladson-Billings (2014) states that educators that encounter race or cultural issues are often not getting the preparation they need. Howard (2003) relates that teachers will eventually meet students whose cultural, ethnic, linguistic, racial, and social class backgrounds differ from their own. Howard also implies that teacher candidates should have opportunities to understand how culture, race, and ethnicity shape what students learn to have opportunities to construct pedagogical practices with relevance and meaning to students' social and cultural realities

The following case study outlines a future secondary education mathematics teacher in a teacher preparation program at a large South Texas university who created and implemented a lesson in "diabesity". This phrase was created from combining diabetes and obesity, two prevalent conditions that have high occurrence in the predominately Hispanic population of South Texas. Laura (pseudonym), the mathematics teacher candidate in this study, created the lesson plan and designed the associated mathematics activities and PowerPoint presentation regarding "diabesity". Laura (pseudonym) presented this lesson to parents and students at an after-school

event in South Texas (University Math - pseudonym), and again to a science teacher preparation class at a different South Texas University (University Science - pseudonym). Data collected from these experiences indicates perceptions regarding diabetes and obesity were changed by both Laura and her university student and adult audiences. In addition, Laura realized the importance of using culturally relevant teaching.

Creating the Culturally Relevant Mathematics Activity

The culturally relevant mathematics activity (CRMA) designed by Laura with help from her faculty mentor began early in the semester with regular meetings and e-mail correspondence between Laura and her faculty mentors. They began to review and choose an appropriate culturally relevant mathematics activity and to design its features and content. They created a Power Point file that was used to introduce the targeted participants with the topic of "diabesity" and to each of the related CRM topics regarding diabetes and obesity. Prior to deciding to do a CRMA project, Laura read several publications about CRM co-authored by both faculty mentors (Ramirez, McCollough & Dias, 2016; Ramirez and McCollough, 2015; McCollough and Ramirez, 2012). The readings motivated her to know more about CRM and how to develop and implement a CRM project for her mathematics course. After several meetings and discussions about CRM, Laura and the local faculty mentor opted to focus on "diabesity"; that is, diabetes and obesity among the Latino population (ADA, 2014; WHO, 2015) since both had an interest in the prevalence of this disease among Latinos in their South Texas communities.

The CRM project plans consisted of mentoring Laura throughout the semester to develop and implement a well-developed project about a culturally relevant math activity regarding "diabesity" among Latinos. Laura researched the prevalence and impact of "diabesity" among Latinos, then using pre-and-post surveys and a 15-minute Power Point file to introduce "diabesity" with statistics about these diseases, used meaningful math activities that would be completed by Latino students and their parents about proper diet, body mass index, and exercise as these factors relate to "diabesity". The CRM activities lasted approximately two hours. The student/parent teams used calculators and computers to complete CRM activities. Laura found astounding statistics about diabetes and obesity among Latinos and used some of the statistics in her 15-minute Power Point introduction on the day of the CRM activities. Laura also chose to involve her "alma mater" secondary school principal to help solicit participants for her project.

Implementation of CRM Activities with the four Latino Students and the Parents

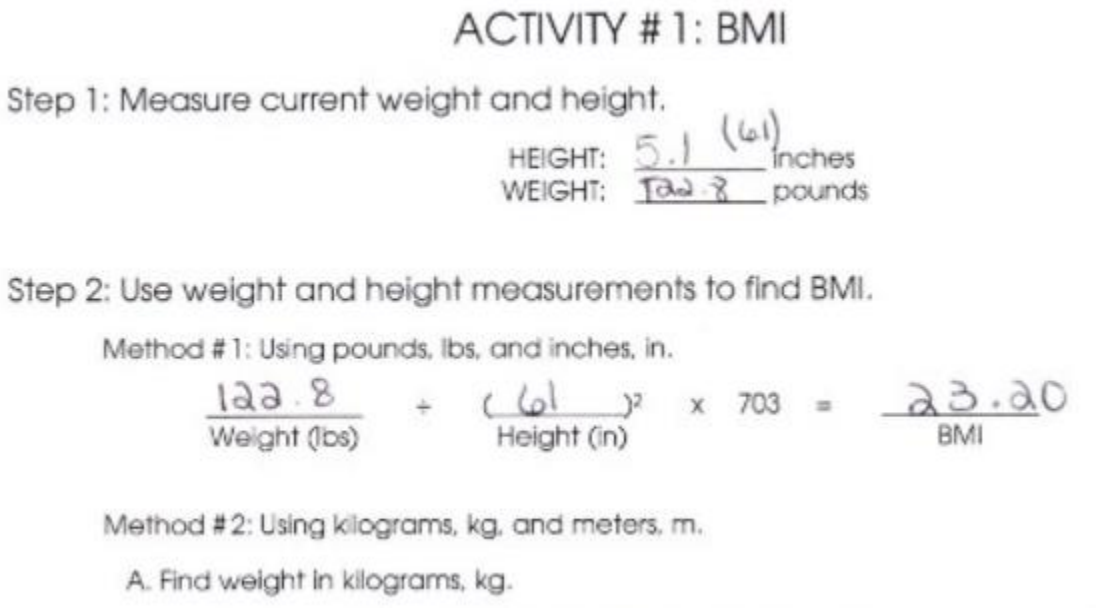
Implementation included a Power Point Presentation and the three CRM activities related to diabetes and obesity that follow. Prior to presentation to the four secondary Latino students and their parents, consent forms and pre-surveys were completed, followed by Power Point presentation, the three-part CRM activities, and ending with completion of post-surveys. The Power Point file included information and statistics about diabetes and obesity in the USA and among the Latino population, especially in South Texas. Major risk factors for getting diabetes were identified and discussed: ethnicity/race, family history and excess weight. In addition, diabetes and diabetes-related diseases such as obstructive sleep apnea, colon cancer, cognitive impairment, cardiovascular disease, heart attack, stroke, kidney disease, urinary tract infections, cancer in the bladder, and sexual dysfunction were shared. The Power Point file presentation was very effective in garnering the participant's interest in "diabesity".

Body Mass Index

Part one of the CRM activity regarded a person's body mass index (BMI) which is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults (WHO, 2015). A person's BMI is grouped into the one of the following four categories; a BMI of 18.4 percent or less is considered underweight, BMI of 18.5-24.9 percent is considered normal, BMI of 25.0-29.9 percent is considered overweight and BMI of 30.0 percent or more is obese.

BMI is an inexpensive, easy way to determine if a person's weight is dangerous to their health. BMI appears to be as strongly correlated with various metabolic and disease outcomes as are these more direct measures of body fatness. People categorized as overweight or obese in terms of BMI often see the overall quality of their lives diminished. In addition to potentially life-threatening health problems that can develop because of a person's excessive body fat, physical capabilities become limited due to stress on the joints and problems can eventually become emotional and mental, such as chronic depression and/or social isolation due to poor body image. Maintaining a healthy BMI, which is as easy as developing a balanced diet and performing physical activities on a regular basis, can lead to a longer, happier, and healthier life. The first steps to take when beginning to work on normalizing your BMI is to develop a balanced diet and to be more active by participating in regular physical activity throughout the week.

Figure 1 and Figure 2: Work by a Latino Student and Parent Doing the CRMA to Calculate their BMI



ACTIVITY # 1: BMI

Step 1: Measure current weight and height.

HEIGHT: 5.1 (61) inches
WEIGHT: 122.8 pounds

Step 2: Use weight and height measurements to find BMI.

Method # 1: Using pounds, lbs, and inches, in.

122.8 (Weight (lbs)) ÷ (61 (Height (in)))² x 703 = 23.20 (BMI)

Method # 2: Using kilograms, kg, and meters, m.

A. Find weight in kilograms, kg.

Measurements for Converting: lbs → kg.

1 kg ≈ 2.2 lbs

122.8 Weight (lbs) ÷ 2.2 lbs/kg = 55.81 Weight (kg)

B. Find height in meters, m.

Measurements for Converting: in → m.

1 in = 2.54 cm **1 m = 100 cm**

61 Height (in) x 2.54 cm/in ÷ 100 cm/m = 1.54 Height (m)

C. Calculate BMI.

55.81 Weight (kg) ÷ 1.52² (Height (m))² = 24.15 BMI

Step 3: Discuss the results.

A. Are the BMI's from Method 1 and Method 2 the same? Why or why not?

no because of an infinity number.

B. What does your BMI say about your health?

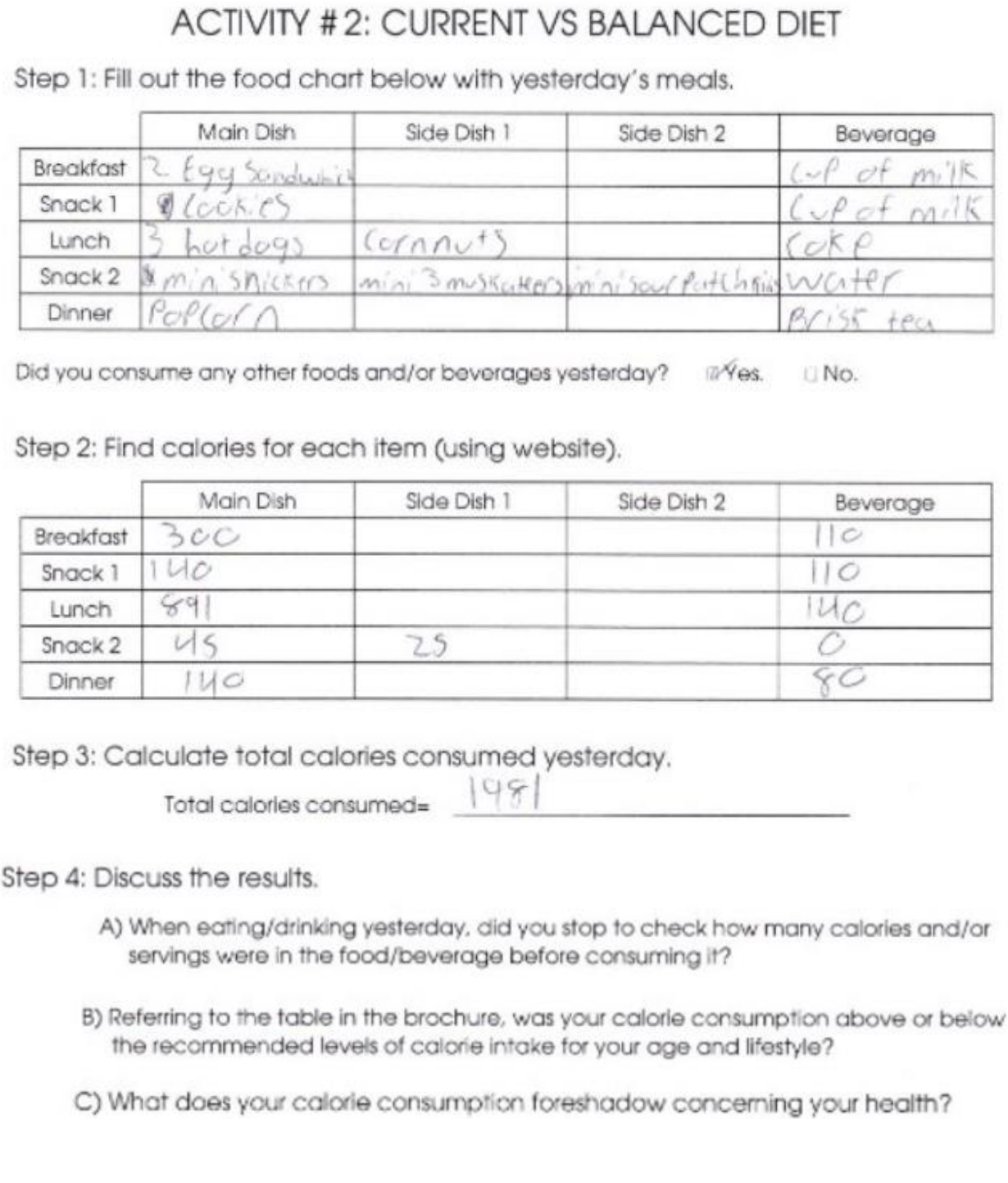
It says that I have a normal health.

Balanced Diet

Part two of the CRM activity concerned keeping a balanced diet to prevent obesity. World-wide, obesity has more than doubled since 1980. In 2014, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 600 million were obese. Most of the world's population live in countries where overweight and obesity kills more people than underweight (WHO, 2015). However, obesity is preventable with a healthy diet. However, when the word diet is heard, many people assume it is a change made to one's food intake for the sole purpose of weight loss. A balanced diet, however, is not a trend but a lifestyle. A balanced diet means choosing the right foods that will help the body to perform at its highest potential and can also prolong life, help to maintain a healthy weight, and increase positive moods. To begin developing a balanced diet, a person must first determine how many calories your body should intake daily. The United States Department of Agriculture has developed guidelines to help determine the proper amount of calorie intake for different ages and lifestyles (National Academies Press, 2002).

A balanced diet alone, however, is not enough to maintain a healthy BMI. Ogden, Carroll, Fryar and Flegal (2015) report that healthy behaviors include a healthy diet pattern and regular physical activity, and that the prevalence of obesity among adults is significantly higher in the Hispanic population as well as in Hispanic Youth aged 2-19 years.

Figure 3 and 4: Work by a Latino Student and Parent Doing the CRMA to Calculate Calories



ACTIVITY # 2: CURRENT VS BALANCED DIET

Step 1: Fill out the food chart below with yesterday's meals.

	Main Dish	Side Dish 1	Side Dish 2	Beverage
Breakfast	2 Egg Sandwich			cup of milk
Snack 1	8 cookies			Cup of milk
Lunch	3 hot dogs	cornnuts		coke
Snack 2	3 mini snickers	mini 3 musketeers	mini sour patch kids	water
Dinner	Popcorn			Brisk tea

Did you consume any other foods and/or beverages yesterday? ☑ Yes. ☐ No.

Step 2: Find calories for each item (using website).

	Main Dish	Side Dish 1	Side Dish 2	Beverage
Breakfast	300			110
Snack 1	140			110
Lunch	891			140
Snack 2	45	25		0
Dinner	140			80

Step 3: Calculate total calories consumed yesterday.

Total calories consumed= 1481

Step 4: Discuss the results.

A) When eating/drinking yesterday, did you stop to check how many calories and/or servings were in the food/beverage before consuming it?

B) Referring to the table in the brochure, was your calorie consumption above or below the recommended levels of calorie intake for your age and lifestyle?

C) What does your calorie consumption foreshadow concerning your health?

Regular Exercise

The third part of the CRM activity regarded regular exercise to avoid being overweight and/or obese, and indirectly, to prevent diabetes. "Physical inactivity" or living a "sedentary lifestyle" are frequently mentioned as causes leading to the development of chronic diseases since being inactive contributes to weight gain. The body to maintains a healthy weight when calories consumed are balanced by the calories burned. When this scale is unbalanced, that is when weight gain or weight loss occurs. The Centers for Disease Control (CDC) reports the amounts of exercise and muscle training at moderate and vigorous intensities to maintain a healthy weight and lifestyle (CDC: Physical Activity, 2008).

Two types of exercise activities are aerobic and muscle strengthening. An aerobic activity is a cardiovascular workout that increases heart rate and the rate of breathing. If the activities are being conducted for at least ten minutes as a time, anything such as riding a bike, going for a jog, or even cutting the grass is considered exercise. A muscle-strengthening activity should work each major group of muscles in your body, from legs and back to your chest and arms, such as lifting weights or doing exercises that utilize your body weight as a form of resistance. Muscle-strengthening activities are measured in repetitions, which is one complete movement of the designated activity. To promote and maintain health, all healthy adults aged 18 to 65 years old need moderate to vigorous-intensity aerobic activity. Muscle-strengthening fits in this category of exercise (Burns & Brusseau, 2017).

Figure 5 and Figure 6: Work by a Latino Student and Parent Calculating Calories Burned through Exercise

ACTIVITY # 3: APPROPRIATE EXERCISE

	Calories Burned per Pound per Minute (CPM)
1. Bicycling (5.5 MPH) – Moderate	.029
2. Bicycling (9.5 MPH) – Vigorous	.045
3. Dance, Aerobic (Medium) – Moderate	.046
4. Dance, Aerobic (Intense) – Vigorous	.061
5. Grocery Shopping – Moderate	.028
6. Jumping Rope (70 Jumps/Minute) – Moderate	.074
7. Jumping Rope (125 Jumps/Minute) – Vigorous	.080
8. Mowing the Lawn – Moderate	.051
9. Running (8-Minute Mile) – Moderate	.095
10. Running (9-Minute Mile) – Vigorous	.087
11. Squats – Vigorous	.096
12. Walking, Asphalt Road (Normal Pace) – Moderate	.036
13. Walking, Fields and Hills (Normal Pace) – Moderate	.037
14. Weight Training (Free Weights) – Vigorous	.039
15. Weight Training (Circuit Training) – Moderate	.023

Step 1: Choose five moderate-intensity exercises from above.

#1: Bicycling (1) .029
#2: grocery shopping (5) .028
#3: Running (8-min mile) (9) .095
#4: Walking (12) .036
#5: Weight training (15) 0.23

Step 2: Calculate calories burned for each exercise performed for 30-minutes.

Activity #1:	190.2	x	.029	x	30	=	165.47
	Weight (lb)		CPM				Calories burned
Activity #2:	190.2	x	.028	x	30	=	154.76
	Weight (lb)		CPM				Calories burned
Activity #3:	190.2	x	.095	x	30	=	542.07
	Weight (lb)		CPM				Calories burned
Activity #4:	190.2	x	.036	x	30	=	205.41
	Weight (lb)		CPM				Calories burned
Activity #5:	190.2	x	.023	x	30	=	131.23
	Weight (lb)		CPM				Calories burned

ACTIVITY #3: APPROPRIATE EXERCISE

	Calories Burned per Pound per Minute (CPM)
1. Bicycling (5.5 MPH) – Moderate	.029
2. Bicycling (9.5 MPH) – Vigorous	.045
3. Dance, Aerobic (Medium) – Moderate	.046
4. Dance, Aerobic (Intense) – Vigorous	.061
5. Grocery Shopping – Moderate	.028
6. Jumping Rope (70 Jumps/Minute) – Moderate	.074
7. Jumping Rope (125 Jumps/Minute) – Vigorous	.080
8. Mowing the Lawn – Moderate	.051
9. Running (8-Minute Mile) – Moderate	.095
10. Running (9-Minute Mile) – Vigorous	.087
11. Squats – Vigorous	.096
12. Walking, Asphalt Road (Normal Pace) – Moderate	.036
13. Walking, Fields and Hills (Normal Pace) – Moderate	.037
14. Weight Training (Free Weights) – Vigorous	.039
15. Weight Training (Circuit Training) – Moderate	.023

Step 1: Choose five moderate-intensity exercises from above.

#1: Dance, Aerobic (Medium) - Moderate
#2: Running (8 Minute Mile) - Moderate
#3: Squats - Vigorous
#4: Walking, Fields and Hills
#5: Weight Training (Circuit Training)

Step 2: Calculate calories burned for each exercise performed for 30-minutes.

	Weight (lb)		CPM		30		Calories burned
Activity #1:	183	x	.046	x	30	=	252.54
Activity #2:	183	x	.095	x	30	=	521.55
Activity #3:	183	x	.046	x	30	=	252.54
Activity #4:	183	x	.037	x	30	=	203.13
Activity #5:	183	x	.023	x	30	=	126.27

Implementation of the CRMA with Science Future Teachers

Accompanied by her South Texas Mathematics University mentor, Laura traveled to South Texas University Science where she conducted the CRMA with a future science teacher methods class of 28 participants (11 Hispanic females, 1 Hispanic male, 15 Caucasian females, 1 Caucasian male). Prior to the activity, the instructor for the course obtained consent forms and gave a brief explanation of Laura's activity for all students. It should be noted this class had been preparing for their own Family Science Night and were informed about the importance of culturally relevant teaching in the classroom via PowerPoint presentations, research and reading (Ramirez, McCollough & Dias, 2016; Ramirez & McCollough, 2015; McCollough & Ramirez, 2012). A pre-survey consisting of 10 Likert-scaled questions was given prior to Laura's arrival. Laura's presentation included all the above activities, and a post-survey was given the following day in this summer-scheduled class. A *t*-test analysis of those results revealed significant results in changed perceptions regarding "diabesity" following Laura's presentation (Table 1).

Table 1 Pre- and Post- Test Quantitative Data

Variable	*p*-value	*t*-value	df	Standard error of difference	Mean
1. Diabesity and obesity are a great concern to me.	0.0002**	4.0499	28	0.093	-0.38
2. Diabetes and obesity are mainly inherited.	0.0107**	2.6825	28	0.168	-0.45
3. Diabetes and obesity are found more in the Hispanic population than Caucasian population.	0.2151	1.2603	28	0.238	0.30
4. I think I should teach about diabetes and obesity in my future classroom.	0.0001**	5.4140	28	0.134	-0.73
5. I think the topics of diabesity and obesity are culturally relevant.	0.0809	1.7930	28	0.243	0.44
6. Diabetes and obesity are personal issues that should not be discussed in the classroom.	0.0114**	2.6555	28	0.132	0.35
7. Diabetes and obesity are conditions found at the same rate in all ethnic groups.	0.3046	1.0403	28	0.216	0.23
8. People who have diabetes and obesity can't help their conditions without medication.	0.0105**	2.6874	28	0.186	0.50
9. Exercise and food decisions can alter the course of both diabetes and obesity.	0.0050**	2.9772	28	0.168	0.50
10. Since I am young I am not really concerned about diabetes and obesity.	0.0091**	2.7458	28	0.164	0.45

** Significant results at $p<0.05$

Items one, two and four in Table 1 have negative mean values as students responded negatively to these items on the pre-test. Positive mean values indicate that they responded positively on the pre-test. Following Laura's presentation, the future science teachers were significantly more concerned about diabetes and obesity ($p = 0.0002$) and more students thought these conditions are inherited ($p=0.0107$). Their thinking about discussing diabetes and obesity in the classroom significantly increased ($p=0.0114$). In addition, they are concerned about these diseases despite their young age ($p=0.009$) and now think that education was not always mandatory for these

diseases (p=0.0105). The most highly significant finding was that the future science teachers felt they should teach about diabetes and obesity in the classroom, whereas this was topic was rated very low in the pre-test (p=0.0001). Item number nine indicated that students initially thought that exercise and food decisions can alter the course of diabetes and obesity, which is true. However, following the presentation, they no longer thought that was true. This may be because they did not understand the BMI calculation or perhaps would like to continue to think that what they are eating is healthy. More research needs to be done with this question and the response.

Laura's presentation to the science future teachers provides significant evidence that Laura clearly understood the subject of diabesity and that she communicated her project effectively. She made an impact on the science future teachers about this CRM activity and the causes of diabesity and its consequences.

Interview Summary with Laura

Following the implementation of the CRM project with the University Science teacher candidates, the faculty mentor from South Texas Science University conducted an open-ended interview with Laura. Laura reported that before the CRM project, she felt improving her mathematics teaching skills would be necessary to help college bound high school students succeed in their chosen careers but had little knowledge to accomplish this. She had a deep desire to be a well-prepared secondary mathematics teacher that could help her students, especially Latino students, to be ready for the transition from high school to college. Laura had the idea to build a sense of importance of culture and wanted to focus on getting families together and her faculty mentor gave her the direction to formalize these ideas. Laura enrolled in in a mathematics project class in the final year of her studies and she welcomed the challenge to do a meaningful mathematics project that would have her work with secondary level students and with their parents. At the beginning of the project, Laura reported that she had never heard of culturally relevant pedagogy and that she had no experiences with connecting culture to mathematics. However, she discovered that by relating the subject to topics relevant to everyday life and culture will help secondary students better understand and value mathematics content.

Laura reported that she was amazed at the shocking statistics about diabetes and obesity. The prevalence in the United States and life-threatening complications resulting from these diseases and more specifically in the Latino population, was an “eye-opening” experience for her. Because Laura comes from a cultural background of mixed races (Caucasian and Hispanic) and because half of her family members are Latinos and at least two have been directly affected by diabetes, she was particularly concerned about “diabesity”. She was also concerned about “diabesity” impacting her two children as her husband and his entire family are Latinos. In doing the CRM project, Laura was driven and motivated not only by academic goals, but by emotions because of her racial background and that of her husband and children. She was stimulated to further learn and develop mathematical activities regarding “diabesity” to raise awareness about the diseases and to help prevent and/or manage them with proper monitoring of weight, calories, and exercise, all of which can be done with simple mathematics.

Laura reported that the most difficult part about developing the CRM project was having to put all the facts about “diabesity” together in a way that would be easy to explain and teach to the participants. She did not want to overwhelm the participants with too much information or

confuse them. At the same time, Laura did not want to limit the information about "diabesity" to minimalize the problem, projecting that "diabesity" prevention was nothing to be concerned about.

Questions regarding her experience at the family learning event revealed that Laura saw parents needed help. She saw that parents are willing to help but did not know how to help. According to Laura, parents "were involved" but did not really want to jump in and had to be lured in by the material. She reported that technology was off-putting to the parents. Laura observed that when students helped the parents, parents learned they can learn from their students. Parents told Laura they were learning from the students and that learning wasn't limited to mathematics. Parents said they saw it was beneficial to sit down and do work with their students. She talked to parents and parents reported that they did not realize they could learn so much from their children until the family learning event. Students saw that parents can do school activities, laugh, make light of it and have a good time. She said the self-esteem of child seemed to increase when they helped parents with the calculator activities. She observed that parents would really so pay attention to their child, help the child, and that this resulted in a "teaching moment". Laura observed pride and confidence in both the parent and child's facial expressions.

Laura speaks Spanish – this created more conversation and created a more comfortable environment as cited in previous research (McDonald, 1997). Parents appreciated the fact that Laura spoke Spanish and parents could express themselves more fully. Children spoke Spanish to parents and spoke primarily in English to Laura. Laura said while there were no real surprises, she was 'awestruck' watching parents and children work together. This made her wonder how she will incorporate this into her future classes. Laura also did not realize so many Spanish speaking people would be in her audience, and then wished she had incorporated more Spanish in her PowerPoint, making a note to adjust her presentation. She knew that the participating families would be first- or second-generation American citizens yet she did not have the time to prepare the presentation in Spanish or provide the Spanish translation on the pamphlet she created and provided at the activity. The lack of translations to Spanish made it difficult for the parents/guardians, who were all Spanish speakers, to complete the surveys without excessive assistance from their child or Laura.

The cooperating school district and high school staff provided help to plan the CRM project. Laura was a former member of both the school and the district, and she was welcomed with open arms because they saw her as one of their successful students now in college and an aspiring mathematics teacher. The school district helped Laura identify the families who were involved in the education of their children. The students were high achieving students at the top of each of their respective classes, and this reflected in their work and how easily they understood the math and the way they helped their parent/guardian during the CRM activities.

Laura reported that every person with whom she came into contact doing the CRM project, helped make this project a pleasant and enlightening experience. Laura also said that one of the most rewarding aspects of this CRM project was watching students work alongside their parent/guardian teaching and helping each other. In some aspects of the project, the parents were more knowledgeable, but when using technology and translating the CRM activity worksheets,

the students were more knowledgeable. They showed that they could achieve more understanding of the CRM activities by working together.

There were times when the CRM activity results were surprising to the participants. For example, when calculating an "overweight" or "obese" BMI, there was much conversing about how or why this was the case. They would laugh and whisper comments to each other about what they ate the day before (information required in the Balanced Diet activity) and what exercises they chose as possibilities (also required in the Regular Exercise activity). The atmosphere during the CRMA was very positive and supportive. Laura said that she would like to believe that after participating in this project, the participants would have changed their diet, if their diet was a problem, and added more exercise if they were lightly active or not at all active. At the very least, Laura reported that the information and mathematics calculations provided the participants with insight to help them decide to stop and think before blindly eating a large fatty meal filled with empty calories or choosing to watch the television instead of going outside and doing something requiring some exercise. In fact, Laura reports that after doing the research on "diabesity" and the CRMA activity, she has begun to change her diet and the foods she feeds her family. She is also choosing to take her family out for walks and trips to the local park instead of staying home and watching a movie. As for the mathematics used in designing the CRM activities, Laura said that it was easy, basic high-school algebra level mathematics. She focused on the use of math formulas because people usually find themselves wondering "when will I ever use this again?". Her intentions included showing the participants that they could understand the mathematics that they were being taught and be able to see that math is not difficult or impossible to learn.

Laura reported that she saw the importance of culturally relevant teaching and that these students are bringing the home into the classroom and the teacher becomes part of the family to which they belong. She felt that as a teacher, you must let the students practice their language, culture, and home traditions. She stated that teachers should create curriculum that is relevant outside of the school as this curriculum helps strengthen their verbal skills and technology skills. According to Laura, "Math is the same in every language. Math is everywhere. You are going to need it every day…we must empower and relate to each child. We need to make math fun to understand. This is why we teach."

In summary, Laura thoroughly enjoyed working on the CRM project and proclaimed that she loved every aspect of this project and is now looking forward to practicing the same culturally relevant teaching principles once she is a certified teacher with a teaching position. Having had the opportunity to work with students and parents/guardians, Laura now believes that everyone gained something out of the CRM project. She states that if more CRM activities are done with families and/or students in their classrooms, the widespread benefits derived from applying mathematical concepts learned in school to cultural issues would be far greater than if mathematics is taught in isolation. Since mathematics was used in the CRM activities to help the participants discover how healthy or unhealthy their food and exercise choices were, Laura now feels more comfortable in sharing that "math is everywhere".

Conclusion

Results show that this example of undergraduate research significantly changed perceptions regarding the use of mathematics with Hispanic students, their parents, and the future science teachers. With the proper application of mathematics in the CRM activities and having them relate to authentic situations, participants were able to see how mathematics is beneficial for everyone and how mathematics can be used to make positive life-changing decisions. Implications suggest that authentic research at the undergraduate level can produce authentic results, increasing depth and interest in teaching with cultural relevancy.

REFERENCES CITED

American Diabetes Association (ADA). 2014. Standards of Medical Care in Diabetes-2014. ADA 37(Supplement 1): S14-S80. 2018.

Burns, R. and Brusseau, T. (2017). Muscular strength and endurance and cardiometabolic health in disadvantaged Hispanic children from the U.S. Preventative Medicine Reports 5, (2017), 21-26. https://reader.elsevier.com/reader/sd/E34B3CB54E23051E505AAE8226F069BA9FE9B3099A1A239D89CE37E67F9B50364B5C0C66BD8FB3E09BBCAD8F5D41BC3E Retrieved June 3, 2018.

Capps, D., Crawford, B. & Constas. (2012). A review of empirical literature on inquiry professional development: Alignment with best practices and a critique of the findings. *Journal of Science Teacher Education 23*: 291-318.

Centers for Disease Control (2008). Physical Activity Basics. https://www.cnpp.usda.gov/dietary-guidelines Retrieved June 5, 2018.

Gillies, R.M., & Nichols, K. (2015). *Research in Science Education, 45*(2), 171-191.

Howard, T.C. (2003). Culturally relevant pedagogy: Ingredients for critical teacher reflection. *Theory into Practice, 42*(3), 194-202.

Hutchison, L. (2012). Addressing the STEM Teacher Shortage in American Schools: Ways to Recruit and Retain Effective STEM Teachers. Action in Teacher Education 34(5), 541-550.

Ingersoll, R.M., & Merrill, E. (2011*).* The status *of* Teaching as a Profession. In J. Ballentine and J. Spade (Eds.), Schools and Society: A Sociological Approach to Education. (p. 185-189) 4th Ed.CA: Paine Forge Press/Sage Publications.

Ladson-Billings, G. (2014). Culturally relevant pedagogy 2.0. *Harvard Educational Review, 84* (1), 74-135.

Luzzo, K. A., Hasper, P., Albert, K. A., Bibby, M. A. & Martinelli, E. A., Jr. (1999). Effects of self-efficacy-enhancing interventions on the math/science self-efficacy and career interest, goals, and actions of career undecided college students. *Journal of Counseling Psychology, 46*, 233-243.

Marx, R. W., & Harris, C. J. (2006). No Child Left Behind and science education: Opportunities, challenges, and risks. *Elementary School Journal, 106*, 476-477.

McCollough, C. & Ramirez, O. (2012). Cultivating culture: Preparing future teachers for diversity through family learning events. *School, Science and Mathematics, (112)*, 7, 443-451.

McDonald, R. (1997). Using participation in public school "family science night" programs as a component in the preparation of preservice elementary teachers. *Science Education 81*(5): 577-595.

National Academies Press. (2002). Estimated Calorie Needs per Day by Age, Gender, and Physical Activity Level. https://www.cnpp.usda.gov/dietary-guidelines Retrieved June 4, 2018.

Ogden, C, Carroll, M., Fryar, C. and Flegal, K. (2015) Prevalence of Obesity Among Adults and Youth: United States, 2011-2014. National Center for Health Statistics, Data Brief Number 219. https://www.cnpp.usda.gov/dietary-guidelines Retrieved June, 4, 2018

Ramirez, O. & McCollough, C. (2015). The Quincera event: Preservice teachers implementing a culturally relevant math activity in a Hispanic Community. *Journal of Mathematics and Culture, 8* (2), 57-69.

Ramirez, O., McCollough, C. & Dias, O. (2016). Creating a model of acceptance: Preservice teachers interact with non-English speaking Latino parents using culturally relevant math and science activities at family learning events. *School, Science and Mathematics 116* (1), 43-54.

Rendón, L. & Kangala, V. (2017). The Latino Student's Guide to STEM Careers. ABC-CLIS, LLC. California: Santa Barbara.

Tsui, L. (2007). Effective Strategies to Increase Diversity in STEM fields: A review of the research literature. *Journal of Negro Education 76* (4), 555-581.

Windschitl, M., Thompson, J., Braaten, M. & Stroupe, D. (2012) Proposing a core set of of instructional practices and tools for teachers of science. *Science Education 96*(5), 878-903.

World Health Organization. 2015. World Health Statistics 2015. http://www.who.int/gho/publications/world_health_statistics/2015/en/ Retrieved June 3, 2018.