



The BEACON

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Queries? email Rebecca Reiss (next page)

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President's Message: Lisa Durkin

In this issue, Dr. Jessica Apgar continues the discussion of culturally relevant practices and how they can be applied to instruction. Important to the discussion is how this type of instruction can work in tandem with the Yazzie/Martinez ruling.

The second article is part of a series on genetics by Dr. Rebecca Reiss where she describes the status of gender and genetics.

How do these new findings translate in the classroom? After observing teaching and learning for over 30 years, these issues are not new to educators who have been paying attention. In 1988, Jose Armas gave a lecture to our middle school staff on culturally relevant teaching. He stressed how important it was to be sensitive to students who were raised with different languages and cultural norms. In terms of gender identity, teachers have had the unique opportunity to note these variations since the dawn of public education. Over the decades, it's been painful to watch the confusion and personal insecurities of students who were tormented by their differences, be them cultural or gender driven, that alienated them from their peers, especially in adolescence when fitting in is paramount.

The string that binds these two articles is how teachers must watch, learn, and listen to students and their differing needs. Forming relationships with students is essential to inform teaching practices and create a harmless environment where students can learn, grow, and belong to our greater shared humanity. Using strict classroom expectations, teachers must protect students who struggle, for any reason, from those who would taunt and gossip, while nurturing customs and attitudes that value learning and tolerance.

For educators, this is a tall order given the torrent of other roles and responsibilities that they shoulder, from active shooters, to meeting educational standards. Distance learning makes it almost impossible to form relationships with students who so desperately need them.

It's important to note that educators cannot do it alone. Support from business and society is essential. Providing educators with resources, as well as showing honor and respect, is sure to manifest in classrooms filled with good grace and educational gains. Your interest in CESE is the kind of support that is effective in meeting those goals. We appreciate your participation.

What is Culturally Relevant Instruction in the Era of Yazzie/Martinez?

Jessica Apgar, Ph.D., Education

Anthony Rodriguez, Ph.D., Education

In conversations around the Yazzie/Martinez v. State of New Mexico case that has become a centerpiece guiding education policy in the state, there are questions about how science and mathematics are impacted by culturally relevant practices, as called for by the ruling in the lawsuit. Our aim in this piece is to provide more information about this landmark case and how it is intended to effect education in our state, to provide more information about what culturally relevant instruction is, and to give a few examples of what it might look like in action.

What is Yazzie/Martinez v. State of New Mexico?

The best description of the case comes directly from the website of The New Mexico Center on Law and Poverty:

Families and school districts, represented by the New Mexico Center on Law and Poverty and families represented by the Mexican American Legal Defense and Educational Fund, sued the New Mexico Public Education Department (PED) and the state legislature for failing to provide a sufficient and uniform system of education to all New Mexican children as guaranteed by the education clause of the New Mexico State Constitution.

The consolidated lawsuit, Yazzie/Martinez v. State of New Mexico challenged the state's failure to provide students—especially low-income, Native American, English language learner (ELL), and students with disabilities—the programs and services necessary for them to learn and thrive, and challenged the state's failure to sufficiently fund these programs and services.[1]

The judge in this case ruled that the state has failed to provide an adequate education that ensures historically marginalized students are college and career ready.

<http://www.cese.org>

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Several programs and services are listed in the ruling that are known to positively impact student outcomes but are not being funded or implemented statewide. The implementation of culturally and linguistically relevant practices are specifically addressed. In this piece, we focus on culturally relevant practice because the linguistically relevant aspect warrants its own space. Attending to the linguistic diversity of students is vital and describing ways to address these important needs will be considered in a future article.

What is Culturally Relevant Practice?

Though there are a variety of terms and phrases used that have different meaning to practitioners and scholars in higher education alike (e.g., culturally responsive practices, historically responsive practices, multicultural education), we are going to specifically focus on the language used within the lawsuit and define culturally relevant practices by taking a more literal view. We intend to introduce the concept for a broad audience, so will define culture and then talk about how that might be interpreted into relevant practices for students.

What is culture? In schools, it is all too commonly defined as what Hammond [2] calls the “surface” level of culture that includes food, holidays, celebration, and dress. But there’s more to it than that and getting beyond the surface aspects is crucial to supporting students’ learning and honoring the real work that many teachers already do each day. Hammond describes additional layers of culture as “shallow” and “deep” culture. Shallow culture goes beyond the surface level and includes rules of interaction, gender roles, and stance toward authority. But the deep culture gets into how culture relates to firmly rooted worldviews. Culture is ultimately “the software for the brain’s hardware” and the “the brain uses cultural information to turn everyday happenings into meaningful events” ([2] p. 22). Let’s talk about how defining culture by each of those aspects might show up in science and mathematics instruction and how these different levels of culture might impact the perceived relevancy for teachers and students.

If culture is defined in the usual surface-oriented way, it can be easy for a math educator, for example, to feel like it is nothing more than an “add-on” or something superficial to address in their lesson plans and check the box of addressing culture within their instruction. The teacher might say, “Great! I’ll go ahead and add in a reference to a student’s particular food or holiday in my word problems,” then go about their day knowing in their gut that they haven’t really done something meaningful for their students while still feeling like they’ve done extra work with no actual results. We know teachers who feel this way but might not really know how else to meaningfully incorporate culture within their instruction.

In the shallow level, we start to consider relational aspects of learning, things we know have a more meaningful impact on students’ retention of information and how they approach learning tasks. The aspects of shallow culture have a strong emotional charge because they relate to social norms and interactions. Examples include students’ concepts of time, the use of personal space, and interactions with authority. These are aspects “that when violated can lead to mistrust, distress, or social friction” ([2] p. 23). An example of addressing this level of culture is when students are given

the option to opt out of dissecting frogs in middle school science class. Families and communities of people who find it offensive to conduct such a task are given a choice about whether or not to participate. A more nuanced example, though, might be found in relation to the use of space in the learning environment. If students' cultural values support close interaction with others, having students spaced apart from each other in individual desks without ways to interact easily might feel foreign and uncomfortable, and genuinely interfere with their learning.

Deep culture encompasses the underlying beliefs that guide all that we do. This represents deeply held worldviews that shape our perceptions of life and things like ideas about good and bad, ethics, spirituality, health, and theories of group harmony ([2] p. 23). At this level threats can trigger flight or fight in the brain because of the intense emotional charge related to the deep cultural aspects of identity. These are the aspects of self that are most related to the schema, the file cabinets in the brain, that we use to organize information in short and long term memory. Because of this, elements of deep culture have an incredible impact on what we learn and how we generalize learning in relevant ways.

Deep cultural attributes include attention to individualism and collectivism. Individualism is more common in American society and includes attention to the individual as the most important unit when considering well-being, action, and interaction in the world. It is often characterized by competition and attention to status and individual achievement, and in the individualist stance learning happens by reading and studying. Collectivism is characterized by a more group-oriented view of well-being, with more attention to interdependence and group dynamics; in this worldview learning happens through group interaction and dialogue ([2] p. 26). Other aspects of deep culture are the difference between oral and written traditions. American schools tend to favor individualism and written traditions that lend themselves to more independent study and performance whereas cultures that value collectivism tend to rely more heavily upon oral traditions like song, storytelling, and poetry as ways to learn, connect, and communicate.

We've given some definitions and examples of culture and how it might show up in classrooms. Relevancy is defined as "the quality or state of being closely connected or appropriate" (merriamwebster.com). To be culturally relevant, the learning that students are engaged with needs to be connected to their own lives, experiences, and situated within their deeply held worldviews so they have a meaningful way to store their knowledge. In schools and classrooms, taking a one-size fits all approach to the integration of culturally relevant practice is not at all recommended. There are certainly elements of individualism, collectivism, written and oral traditions,

and everything in between that can and should be a part of learning experiences in schools. But these deeply seeded aspects of culture are what need attention when we talk about culturally relevant education. It is crucial for us to shift our mindset away from hearing the word culture and immediately assuming it is about food, holidays, dress, etc. and instead think about the ways we can incorporate in our instruction the ways that students view the world and organize experiences.

A word about standards

Standards guide instruction and are statements about what is important for students to learn. The learning expectations related to science instruction in New Mexico are found in the Next Generation Science Standards (NGSS, [3]) and are currently in the early phases of implementation across the state. These new standards represent major shifts from previous science standards, with more focus on scientific processes and practices, a new focus on engineering, and an emphasis on the interdisciplinary nature of science with intentional connections to English Language Arts and Mathematics standards.

What might be less well known to both teachers and the public is the effort expended to ensure that these standards directly address increased opportunities for historically marginalized students, such as those directly named in the Yazzie/Martinez lawsuit, to learn science. An entire appendix is dedicated to the ways that diversity and inclusion are addressed within the structure and content of the standards. This includes directly addressing the role of institutionalized privilege and refers to the ways that culturally dominant groups have decided what has previously counted as important scientific knowledge and how that knowledge is taught in schools. The NGSS intentionally and directly support culturally relevant instruction.

Mathematics instruction is guided by the Common Core State Standards (CCSS) in Mathematics. Adopted in 2011, these standards also represent major shifts in approaching the development and application of mathematical knowledge for students. Instead of a focus on rote memorization of concepts and skills, the focus is mathematical thinking and practices intended to ensure that learning is more generalizable and applicable for students throughout the grades.

The new NGSS and CCSS Math standards emphasize critical thinking and dynamic learning processes. Both are conducive to applying what we know about how students learn in order to help them retain ways of thinking and interacting in the world. This includes supporting students to navigate endless amounts of information while building their knowledge of important concepts. We can no longer expect that all students learn in the same ways, just as we can no longer expect that we know how they will apply

their knowledge and skills after school. Innovation occurs as rapidly as the imagination will allow and our students need the agility to engage with their ever-changing world. We have known for a long time that students do this best when they are able to build on and make connections to their own existing knowledge [2][4]. How do we help students make these meaningful connections in science and math classrooms in New Mexico?

An efficient way of developing culturally relevant instruction from the start is to review the academic standards with community members. In a fall open house, for example, present the standards to the community and ask them what community practices they can think of that meet these standards. When working at a Native American Pueblo Community School, one of the authors learned about the irrigation practices of the village, how many cubic feet of water will flood a field each week in the growing season for chile, pumpkins, squash, and corn. This conversation with a coworker, who talked about his weekend work out in the fields, turned into a math and science problem, one that the students could add their own experiences to while solving a standards-based problem.

Culturally and linguistically relevant education and the planning and preparation of curriculum requires inclusion of the community from the start. Bringing them to the school, inviting them to be honored members of committees that have impact on daily work in the school demonstrates respect, care, and value. The diverse and rich resources of our elders can be leveraged into real world science and math curriculum. Many will gladly spend time helping the school if they feel heard and know that the time they spend will result in change. Lawsuits happen when voices are ignored.

Change happens after the community's trust is earned through daily action on behalf of their children, work done that meets their needs, and self-determined goal setting. If we are the content experts, we can adjust, modify, and accommodate the unique children in our classrooms. With this in mind, we will develop creative lessons connected to standards and demonstrate that high leverage teaching and learning that includes culture from the start and not as a retro-fit.

Attending to deep cultural connections

CCSS in Mathematics and NGSS compel us to teach real world, high context lessons connected to the daily experiences of our students and our communities. Cultural responsiveness requires us to learn about the communities we teach in and honor those community practices that meet standards in curriculum. In both standards we notice how important learning math and science in ways that resonate personally to each student matters, drives, and supports students to do their best.

These standards are not new at all to the math and science community.

In mathematics, Ubitran D'Ambrosio saw the high leverage elements of integrating the daily practices of the community with the most challenging aspects of teaching and learning mathematics. He came to research how ethnomathematics, mathematics of the community, supports students during rigorous problem solving. Instead of decontextualizing and removing inherent value of real problems, he engaged deeper, sought local practices to underscore concepts and skills to increase performance in the mathematics students in class. Whether you are examining the sheer scale of the Mayan Pyramids or the local farming practices along the Rio Grande, core community based ethnomathematics, when taught within the common core, create a dynamic mix of relevance and rigor.

We have always used inquiry, connected to the curiosity and personal interests of our students to develop the driving questions of scientific investigation. The wise teacher has always taken the time to learn all they can about what interests, motivates, upsets, and encourages so they can develop lessons that include these students. The NGSS directs us to our empirical, evidence-based tool, the scientific method.

One lesson that historically has impacted many sedentary communities for thousands of years, and essentially all communities in modern times, is that of the simple concrete mixture of cement, aggregate, sand and water. In science students can learn about polymerization, hydration, and the curing of concrete across days. They can also experiment with different aggregates, different ratios of aggregates to test curing time, strength, flexibility, and level of adherence. In math, they can learn all about ratios, percentages, unit rates, proportions, weight, measurements of scale, and even see how many 45 pound weights can sit upon a 6 inch pad before it cracks. This type of lesson not only offers cross-cultural learning opportunities, but also infuses math and science together in ways that students can practically apply. Engaging in culturally relevant practices means integrating the math and science of everyday people in the communities where the teaching and learning is occurring. This adds value in both rigor and relevance and the chances are high that if educators engage with the standards from a culturally relevant lens, they will also notice an uptick in enjoyment within their discipline and have more fun teaching.

Teacher decision making regarding the implementation of content, tools, and components of instruction reflects their value systems, of what counts and what does not. Teachers determine what targets students will be required to hit and how they will be expected to demonstrate this knowledge through various types of assessment. Working to develop a classroom that supports all learners and incorporates aspects of deep culture requires educators to interrogate what they are doing and why.

Final Thoughts

Yazzie and Martinez v. State of New Mexico is a wake-up call and an opportunity for our state to do great inclusive work for all people. It is time to begin a needed remodeling of those aspects of the current system that led to the court ruling. With a dedication to more deeply understanding culturally relevant instructional practices, educators and policymakers alike can work to fully support historically marginalized groups. New Mexico has a unique opportunity to show the country that all means all.

To accomplish these goals, all stakeholders must understand the depth and complexity of this undertaking. Educators must be given the time and resources to reflect upon their learning, their classroom experiences, their own strengths, and biases. They must be given support to deconstruct these items in ways that translate to meaningful classroom practice. Educational entities across the state have a responsibility to create processes that show a commitment to including the ideas and feedback of the families we serve. Without these connections, attention to deep culture will not have the impact that is possible. Education leaders in the state can open the door for communities to have real voice by committing to creating systems that will provide educators the time and space to cultivate these relationships. Listening and responding to all community voices is the only way to reach the goal of building and sustaining meaningful connections that will positively impact outcomes for students in our state.

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My genes, your genes, we all have the same genes

II. Gender and Genetics

Dr. Rebecca Reiss, Professor Emeritus Biology, New Mexico Tech

In the first essay of this series, I described the major misconception about genetics; that our genes are different (<http://www.cese.org/wp-content/uploads/2018/05/2018-05-Beacon.pdf>). Our genes are the same; I have genes that code for hair color and so do you (even if you don't have hair.) It is the variants of genes, known as alleles, that make us different, and the expression of these alleles, may change over time. There are two points about genetics that I'd point out to students taking my genetics course. First, genetics explains why we are the same and why we are different. Second, genetics is a crap shoot.

This essay is inspired by recent comments that suggest all we need to do to understand gender is to follow the science. If you think that this means that there are two genders and that assignment of gender at birth is infallible, think again. Let's follow the science of genetics.

The first relationship understood by most people is that females have two X chromosomes, that males have one X and a Y, and it is the presence of the Y that determines 'maleness.' The second is that the gender of a newborn (or anyone, for that matter) can be easily determined by looking at the external genitalia. But there are instances where the genitalia are misleading and even a chromosomal test may not resolve gender identification.

While most males are XY and most females are XX, there are individuals who carry different numbers of the X and the Y chromosomes. Dr. Harry Klinefelter published a study in 1949 about a group of men who had mysteriously developed breasts that resembled those of females. It turned out that these men were XXY and we now estimate that about 1 in 650 newborn males are born this way. There are a wide range of possible symptoms associated with XXY syndrome (a.k.a. Klinefelter's syndrome) and the condition can be expressed differently in individuals. One characteristic that XXY individuals seem to have in common is that they are sterile. The condition is not diagnosed until a chromosome test is done, usually after puberty and potentially when infertility becomes an issue. If XXY individuals can't reproduce because they can't produce viable sperm, how is this syndrome transmitted? Rather than a mutation in a specific gene, it is caused by mistake during division of the cells destined to become either egg or sperm. You may be familiar with Down syndrome, which can be caused by the same process involving chromosome 21; these individuals carry three copies of 21 that results in wide array of symptoms, including variable learning disabilities. In both syndromes, chromosomes stick together instead of separating, so instead of winding up in different cells, they

end up the same cell, a process known as non-disjunction. Unlike Down syndrome, XXY is not related to the age of the mother and can be due to non-disjunction in either the mother or the father. Just because this is genetics, there is an exception to the 'rule' of infertility, and that is when an individual has cells that are XXY and some that are XY, a condition known as mosaicism. More on that later. This question remains; what gender are XXY individuals?

It should come as no surprise that the development of gender is extremely complicated and involves many different genes. Understanding this fact leads to the hypothesis that a mutation in any of these genes can cause gender assigned at birth based on the appearance of the external genitalia can be wrong. The Online Genetic Inheritance in Man (OMIM) is the major database for human geneticists [1]. It is the catalog of variants of genes that are associated with difference in human health, appearance and physiology. A recent scan of this database reveals at least 30 genes with variants that are associated with sex-reversal syndromes, which can result in XX males and XY females. The best-characterized of these genes is the androgen receptor (AR) gene, which is located on the X chromosome. AR codes for a protein on the outside of cells that receives chemical signals from outside the cell and transmits the information into the cell. One of the molecules AR can detect is androgen, which causes the pathway to maleness to be activated. AR variants can be insensitive to androgen and cause androgen insensitivity syndrome (AIS). In its most extreme form, external genitalia at birth look female and the condition is often not diagnosed until puberty, when expected female development fails to begin. Upon medical examine it is determined that the vagina is a blind canal and there is no uterus or ovaries. Puberty can be traumatic, imagine being brought up female with expectations of childbearing, then finding out that you are genetical a male. What's a teenager to do when diagnosed with AIS?

All mammals share the same sex determination; XX are usually female and XY individuals are most often male, but genetics is full of exceptions; hence the comparison to a crap shot. The case of mosaics who carry both XY and XXY cells involves the non-disjunction of chromosomes sometime after conception. You may be aware that calico cats are female and that male calicos are very rare. Females are mosaic for the X since one X is shut down during development and in calicos the sectors of color are indicative of different Xs being silenced in specific cells. Then all the progeny of that cell will only express the genes on the active X. The rare instances of male calicos are due to those cats being XXY.

Non-disjunction events can result in individuals missing a chromosome. Turner syndrome is caused by only having one X chromosome (XO) and they are female. The symptoms are variable and can include shortness, web necks, and learning disabilities, but these may be very subtle. These individuals are sterile so this is another case that may not be diagnosed until infertility issues arise. If

this type of non-disjunction occurs during the development of a male, the result can be a mosaic XY/XO individual. Half-female, half-male individuals, known as gynandromorphs have been observed in insects, crabs, and birds, but not mammals. In theory, this could result in a human with male tissue adjacent to female tissue. This may explain those who feel their assigned gender does not match how they feel. Proving this would require a post-mortem examination of tissues, so it has yet to be confirmed.

An even stranger condition are chimeras, which result from the merging of two fertilized eggs to form one person. An example of a human chimera was a woman who needed a kidney donation [2]. Testing of her children initially found that she was not to be the biological mother of some of her children. After all reasons for this finding were exhausted, such as adoption or switched at birth, a DNA survey of multiple tissues was done. The findings indicated that some tissues matched her as the mother while other tissues were from a different, but related individual. The conclusion was that the two eggs, fertilized at the same, had merged. Information from both were retained but in different tissues. How common is this? We have no idea since this woman lived a normal life and was able to bear children. Other examples have been identified, including those with XY and XX tissues [3].

If we truly follow and understand the science, we find ourselves celebrating the marvelous diversity of the human species. As we have developed ways to accommodate and even celebrate those with Down syndrome, we will hopefully develop acceptance of those with gender differences.

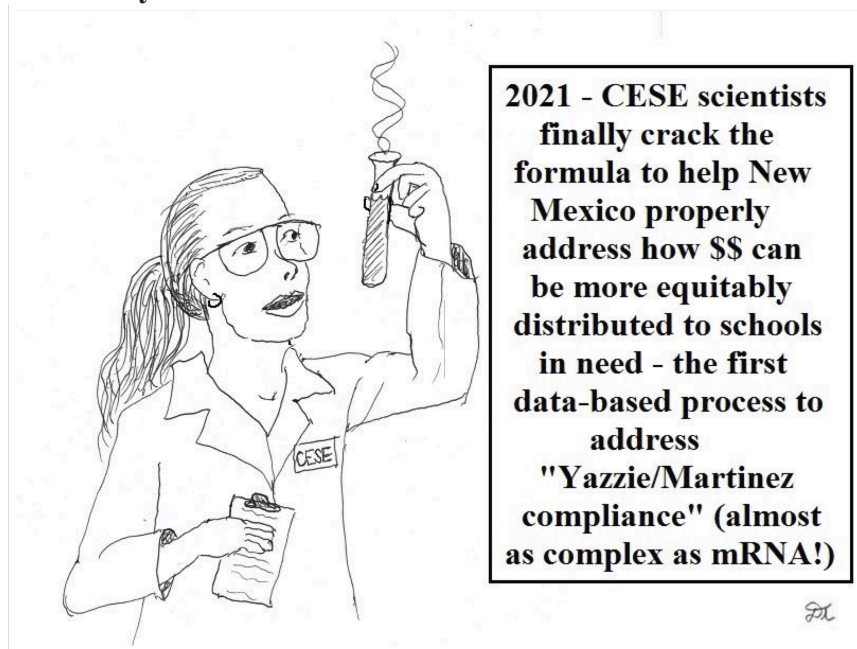
When I consider the wondrous diversity of the human species, I find it hard to understand the fear some feel when faced with those who do not conform to the norm. This sentiment was best expressed by Tom Lehrer, in his 1965 recording 'That was the Year That Was,' when he remarked in his introduction to the song National Brotherhood Week

I'm sure we all agree that we ought to love one another, and I know there are people who do not love their fellow human beings, and I hate people like that.

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A Toon by Thomas



NEWS FLASH: CESE at the Round House: Video from the 2021 Legislative Session
<https://www.youtube.com/watch?v=Plf56lkXoM0>.

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**CESE is pleased to announce our speaker for our annual meeting will be
Dr. Tracie Collins, MD, MPH, MHCDS
Secretary of the New Mexico Department of Health**

'Predicting the pandemic: what to expect in the post-CoViD world'

Please join us live on YouTube, Sat, June 5th, 1:30 - 2:30

https://youtu.be/8X8GWFA2x_o

Dr. Tracie Collins was appointed as the secretary of the NM DOH in Nov. 2020. Prior to that, she was the Dean of the UNM College of Population Health. She is a MD, holds a Master of Public Health (MPH) from the Harvard School of Public Health, and a Master of Health Care Delivery Science (MHCDS) degree from Dartmouth. Her understanding of the importance of data in public health administration has been instrumental in NM's successful campaign against the pandemic. CESE has posed three questions for Dr. Collins to consider:

The first question is inspired by our interest in data; how accurate have the predictions been regarding the trajectory of the pandemic and what is predicted for the future?

Second, since CESE is dedicated to education, how can teachers leverage the increased interest in biomedical careers in their classrooms?

And finally, based on her experience, what advice does she have for the next generation of medical professionals?

**Live Q&A and business meeting will follow, please e-mail Kim Johnson
(kimber@comcast.net) for the Zoom link for these events.**